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**HERPETOLOGICAL PUBLICATIONS OF THE  
NATIONAL MUSEUM OF NATURAL HISTORY (USNM),  
1853-1994**



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National Museum of Natural History



**SMITHSONIAN  
HERPETOLOGICAL INFORMATION  
SERVICE  
NO. 101**

1994

SMITHSONIAN  
HERPETOLOGICAL  
INFORMATION  
SERVICE

The SHIS series publishes and distributes translations, bibliographies, indices, and similar items judged useful to individuals interested in the biology of amphibians and reptiles, but unlikely to be published in the normal technical journals. Single copies are distributed free to interested individuals. Libraries, herpetological associations, and research laboratories are invited to exchange their publications with the Division of Amphibians and Reptiles.

We wish to encourage individuals to share their bibliographies, translations, etc. with other herpetologists through the SHIS series. If you have such items please contact George Zug for instructions on preparation and submission. Contributors receive 50 free copies.

Please address all requests for copies and inquiries to George Zug, Division of Amphibians and Reptiles, National Museum of Natural History, Smithsonian Institution, Washington DC 20560 USA. Please include a self-addressed mailing label with requests.

## INTRODUCTION

The first list of USNM herpetological publications was issued in 1968 as No. 1 of the Smithsonian Herpetological Information Service (SHIS) series. In preparing the list, J. A. Peters scanned the tables of contents of the various Smithsonian publications for articles specifically mentioning amphibians and reptiles; paleontological, parasitological and general natural history papers were not included.

In the ten years since the first list appeared, the Smithsonian publications series have changed significantly. The *Bulletin*, *Proceedings*, and *Miscellaneous Collections* all have been discontinued and replaced by the *Contributions* series, two of which (*Smithsonian Contributions to Zoology* and *Smithsonian Contributions to Paleobiology*) are potential outlets for herpetological papers.

In using, correcting and updating the 1968 list, I was confronted with decisions on exactly what should be included in a list of "herpetological" papers. It seemed highly superficial to list only those papers that mentioned amphibians or reptiles in the title, since several reviews with very significant herpetological information would have been excluded (e.g. Abbott, *Proceedings*, Vol. 16, No. 973). Similarly, it seemed unfair to bibliographers or authors of catalogue accounts to exclude parasitological papers, since such peripheral information often is hardest to locate. The most difficult decision was where to cut off paleontological coverage. I felt that most of Gilmore's work on dinosaurs was inappropriate but that many fossil papers dealing with sub-recent material were pertinent. However, in working through the paleo titles I found that recent species were reported or discussed in papers on Pleistocene or even Pliocene faunas. Consequently, I decided to include all herpetological papers, fossil and recent.

Although I have tried to avoid arbitrariness, I confess that a certain degree has been necessary; for example, whether to include a paper on birds that discusses similarities between fossil birds and reptiles. My rationale for inclusion was whether or not the discussion was "significant;" certainly it cannot be denied that my concept of significance may not agree with others in the scientific community but I have tended to be liberal with my inclusions. I chose not to include papers in the "Explorations and Field Work" series that appeared from the 1920's to the 1940's. These titles would have greatly expanded this list and, although some useful information on localities, itineraries, etc. are contained in the summaries, no purely herpetological data are included.

I have long felt that a shortcoming of the first list was the lack of concern with dates of publication. Although most of the Smithsonian series have been fairly reliable about ensuring that the proper year of publication appears on separates, the exact date often is very useful when dealing with the nomenclature of older names. Consequently, I have expended considerable time and effort in establishing exact dates whenever possible. In some cases this was simple, since many of the recent papers had the dates printed on the separates, but more often than not some digging was necessary.

It was difficult to establish dates for earlier papers and in some cases it was not possible. The earliest volumes of the **Proceedings** were published by "signatures" of varying numbers of pages.\* Often the end of a given signature did not coincide with the end of a paper, so portions of one paper were published on one date and the remainder of the same paper may have appeared several months later. In these cases I have attempted to give inclusive dates for the entire paper, although the annotations for some signatures were very confusing.

At the back of the table of contents in **Proceedings** volumes 9-11, there is an explanation that the articles were "stereotyped" on the date at the bottom of the signature page but that the actual date of publication for each signature is given in the front of the volume. In these cases both the "stereotyped" date and the later "published" date are given, with the latter assumed to be the correct date of publication. Unfortunately, there is no indication if the same situation obtained with volumes 1-8, and a search of the records in the Smithsonian Archives and Press did not clarify the problem. Consequently, the signature dates are regarded as publication dates for volumes 1-8; it should be emphasized that some doubt exists and that additional data in the future could modify these dates.

Starting with Volume 12, each article was individually printed and the date of publication was more firmly established. These dates appeared in the Table of Contents for each volume, issued at the end of the year for inclusion in the bound set in the Smithsonian's main library. From Volume 32 to Volume 54, dates of publication appeared on the cover of separates from the **Proceedings**; these dates were verified by cross-checking with the dates in the tables of contents.

\* [Footnote, USNM Bull. (93):39. Proceedings papers Nos. 1-760 [vol. 1-11] were issued by signatures, and when the published date for a signature differs from the date it was received from the printer at the National Museum, the latter date has been used here as the actual date of publication. After No. 760 each article has its actual date of publication recorded in the completed volume of **Proceedings**.]

A similarly chaotic system was used for the earlier **Miscellaneous Collections**; as a consequence, the advertisement page for Volume 2, no. V lists 1862 as the date of publication but the various articles therein are dated from 1852 to 1862. Specifically, the Baird & Girard **Catalogue** (art. 49) has January 1853 on the cover and this date is verified in Baird's (see Bull. 20) and Girard's (Bull. 41) bibliographies (but also see Adler, K., J. Ohio Herpetol. Soc. 4:55-57, 1963).

The later **Miscellaneous Collections** followed much the same format as the **Proceedings** and dates were determined from the tables of contents. In some cases the "Quarterly Issue" **Miscellaneous Collections** were duplicated in the regular series. In the first edition of this list the "Quarterly Issue" numbers were listed separately and several titles were included incorrectly. I have attempted to minimize confusion by listing all under **Miscellaneous Collections** and using the earliest publication date when a paper appeared in both "series".

A limited number of copies of each **Bulletin** were stamped with the date of publication on the "Advertisement" page. Number 58 and 60 had the date printed on the title page.

The **Contributions to Zoology** also have a limited number of copies stamped with the date of publication. These dates have been cross-checked with the typed tables of contents in the bound set in the Smithsonian reference collection.

If no specific date is included with the citation, it indicates that one could not be determined; two dates indicates disagreement between the dates stamped in two individual copies and the first date given is assumed to be correct.

For some of Cope's earlier papers in Smithsonian series, I utilized the following reference to help determine proper dates:

Osborn, Henry Fairfield. 1930 Biographical memoir of Edward Drinker Cope 1840-1897. Natl. Acad. Sci. Biogr. Mem. 13(3):127-317.

Cope's annotated bibliography is found on pp. 172-317, and an explanation of the extensive research on publication dates and titles of Cope's many papers is given on p. 172.

R.I. Crombie  
1978

## AVAILABILITY

With the exception of the more recent numbers of the SHIS series, the publications of this list **ARE NOT** available from the Division of Amphibians and Reptiles, the Smithsonian Institution Press, the National Museum of Natural History, or the Government Printing Office.

## COMMENTS ON 1994 UPDATE

This update follows the criteria outlined in the earlier edition (SHIS 42). The order of presentation has been rearranged by date of origin of the publication series. A list of the SHIS pamphlets has been added, but they are dated only to year owing to their quasi-publication status.

The author owes a great deal to Leslie K. Overstreet, former librarian for the Vertebrate Zoology branch libraries, for her conscientious bibliographic assistance. Kraig Adler also pointed out his article clarifying the date of publication for Baird and Girard's **Catalogue** (Misc. Coll., vol. 2). Patricia Zug transferred the original typescript to a computer file. W. Ronald Heyer and Linda K. Gordon proofed a preliminary draft of this update.

R.I. Crombie  
August 1994

## ANNUAL REPORTS OF THE SMITHSONIAN INSTITUTION

(1847 - Present)

Currently called "Smithsonian Year"; inclusion of scientific papers was discontinued in 1964.

## YEAR

1854. Brainard, David. On the nature and cure of the bite of serpents and wounds of poisoned arrows. Pp. 123-136. 1855.
1854. Head, J.F. Some remarks on the natural history of the country about Fort Ripley, Minnesota. Pp. 291-293. 1855.
1854. Mann, Charles. Habits of a species of salamander (Ambystoma opacum) Bd. Pp. 294-295. 1855.
1854. Hoy, P.R. On the Ambystoma luridum, a salamander inhabiting Wisconsin. Pp. 295. 1855.
1877. Weismann, August. On the change of the Mexican axolotl to an Ambystoma. Pp. 349-375. 1878.
1888. Dall, William H. Professor Baird in Science. Pp. 731-738. 1890.
1889. Lucas, Frederic A. Animals recently extinct, or threatened with extinction, as represented in the collections of the U.S. National Museum. Pp. 609-649. 1891.
1893. Marey, E.J. Comparative locomotion of different animals. Pp. 501-504. 1894.
1900. Lucas, Frederic A. The restoration of extinct animals. Pp. 479-492. 1901.
1901. Lucas, Frederic A. The dinosaurs or terrible lizards. Pp. 641-647. 1902.
1901. Langley, S.P. The greatest flying creature. Pp. 649-653. 1902.
1901. Lucas, Frederic A. The greatest flying creature, the great pterodactyl Ornithostoma. Pp. 654-659. 1902.
1902. Howes, G.B. The morphological method and recent progress in zoology. Pp. 581-608. 1903.
1906. Andrews, C.W. The recently discovered Tertiary Vertebrata of Egypt. Pp. 295-307. 1907.

1911. Pozzi, S. The garden of serpents, Butantan, Brazil. Pp. 441-446. 1912.
1912. Kammerer, Paul. Adaptation and inheritance in the light of modern experimental investigation. Pp. 421-441. 1913.
1914. Baker, Frank. The National Zoological Park and its inhabitants. Pp. 445-478. 1915.
1917. Safford, W.E. Natural history of Paradise Key and the nearby Everglades of Florida. Pp. 377-434. 1919.
1917. Hollister, N. The National Zoological Park: A popular account of its collections. Pp. 543-593. 1919.
1918. Gilmore, Charles W. Reptile reconstructions in the United States National Museum. Pp. 271-280. 1922.
1920. Gilmore, Charles W. The horned dinosaurs. Pp. 381-388. 1922.
1923. Matthew, W.D. Recent progress in vertebrate paleontology. Pp. 273-289. 1925.
1923. Hollister, N. Animals in the National Zoological Park. Pp. 291-338. 1925.
1923. Sowerby, Arthur de Cable. The natural history of China. Pp. 351-368. 1925.
1925. McAtee, W.L. The role of vertebrates in the control of insect pests. Pp. 415-437. 1926.
1929. Tolmachoff, I.P. Extinction and extermination. Pp. 269-284. 1930.
1938. Walker, Ernest P. Eyes that shine at night. Pp. 349-360. 1939.
1941. Walker, Ernest P. Care of captive animals. Pp. 305-366. 1942.
1941. Stirling, M.W. Snake bites and the Hopi Snake Dance. Pp. 551-555. 1942.
1943. Cochran, Doris M. Dangerous reptiles. Pp. 275-323. 1944.
1951. Clark, A.H. The fauna of America. Pp. 287-302. 1952.
1951. Leutscher, Alfred. The mechanics of snakes. Pp. 303-312. 1952.
1952. Clark, A.H. The ecology, evolution, and distribution of the vertebrates. Pp. 283-303. 1953.

1959. Goin, Coleman J. Amphibians, pioneers of terrestrial breeding habits. Pp. 427-445. 1960.
1964. Russell, Findlay E. Venomous animals and their toxins. Pp. 477-487. 1965.

SMITHSONIAN CONTRIBUTIONS TO KNOWLEDGE

Vol. 1 - Vol. 35  
(1848 - 1916)

Art. Publ.  
Vol. No. No.

- |    |   |   |
|----|---|---|
| 2  | 5 | Gibbes, Robert W. <u>Mosasaurus</u> and the three allied new genera, <u>Holcodus</u> , <u>Conosaurus</u> , and <u>Amphorosteus</u> . 13 pp. 1851.                         |
| 5  | 4 | Wyman, Jeffries. Anatomy of the Nervous System of <u>Rana pipens</u> . 51 pp. March 1853.   |
| 6  | 7 | Leidy, Joseph. The ancient fauna of Nebraska, or a description of remains of extinct Mammalia and Chelonia, from the Mauvases Terres of Nebraska. 126 pp. June 1853.      |
| 8  | 5 | Jones, Joseph. Investigations, chemical and physiological, relative to certain American Vertebrata. xi + 137 pp. July 1856.   |
| 12 | 6 | Mitchell, S. Weir. Researches upon the venom of the rattlesnake: With an investigation of the anatomy and physiology of the organs concerned. ix + 145 pp. December 1860. |
| 13 | 9 | 159 Mitchell, S. Weir and George R. Morehouse. Researches upon the anatomy and physiology of respiration in the Chelonia. ix + 42 pp. April 1863.                         |
| 14 | 6 | Leidy, Joseph. Cretaceous reptiles of the United States. v + 125 pp. May 1865.  |
| 26 | 1 | 647 Mitchell, S. Weir and Edward T. Reichert. Researches upon the venoms of poisonous serpents. ix + 186 pp. 1886.  |
| 35 | 3 | 2382 Foote, J. S. A contribution to the comparative histology of the femur. ix + 242 pp. 1916.  |

**MISCELLANEOUS COLLECTIONS**  
 (including Quarterly Issue)

Vol. 1 - Vol. 153  
 (1858 - 1969)

Publ.	Vol. No.	No.	
2	v	49	Baird, Spencer Fullerton and Charles Girard. Catalogue of North American reptiles in the museum of the Smithsonian Institution. Part I. Serpents. xvi + 172 pp. January 1853. (March 1853; see discussion in Adler, K., 1963, J. Ohio Herpetol. Soc. 4(1-2):55-57.)
2	vii		Owen, R. Reptiles. In Directions for collecting, preserving, and transporting specimens of natural history (Third Edition). 40 pp. (pp. 22-23). March 1859.
15	xi	320	Henry, Joseph. Circular relating to collections of living reptiles. 2 pp. 1878.
		517	Yarrow, H. C. Check list of North American Reptilia and Batrachia, based on specimens contained in the U.S. National Museum. 28 pp. 1883.
45		1425	Lucas, Frederic A. A new plesiosaur. p. 96. 9 December 1903. (Quarterly Issue Vol. 1)
45		1450	Smith, Hugh M. Notes on the breeding habits of the yellow-bellied terrapin. pp. 252-253. 11 April 1904.
47	2	1487	Stejneger, Leonhard. A new species of lizard from the Riukiu Archipelago, Japan. pp. 294-295. 9 November 1904. (Quarterly Issue Vol. 2)
48	4	1696	Reese, Albert M. The breeding habits of the Florida alligator. pp. 381-387. 4 May 1907. (Quarterly Issue Vol. 3)
50	1	1706	Stejneger, Leonhard. A new calamarian snake from the Philippine Islands. pp. 30-31. 8 April 1907. (Quarterly Issue Vol. 4)
51	1	1791	Reese, Albert M. The development of the American alligator ( <i>A. mississippiensis</i> ). 66 pp. 1908.
52	4	1874	Stejneger, Leonhard. Description of a new frog from the Philippine Islands. pp. 437-439. 4 August 1909. (Quarterly Issue Vol. 5)

- 54 2 1922 Reese, Albert M. Development of the brain of the American alligator: The paraphysis and hypophysis. 20 pp. 1910.
- 56 11 1946 Reese, Albert M. Development of the digestive canal of the American alligator. 25 pp. 29 October 1910.
- 61 5 2184 Gilmore, Charles W. A new dinosaur from the Lance Formation of Wyoming. 5 pp. 24 May 1913.
- 61 8 2232 Foote, J.S. The comparative histology of the femur. 9 pp. 22 August 1913.
- 63 3 2262 Gilmore, Charles W. A new ceratopsian dinosaur from the Upper Cretaceous of Montana, with note on Hypacrosaurus. 10 pp. 21 March 1914.
- 65 2 2356 Reese, Albert M. The development of the lungs of the alligator. 11 pp. 3 March 1915.
- 72 10 2652 Foote, J. S. The circulatory system in bone. 20 pp. 20 August 1921.
- 72 14 2663 Gilmore, Charles W. A new sauropod dinosaur from the Ojo Alamo Formation of New Mexico. 9 pp. 31 January 1922.
- 77 9 2832 Gilmore, Charles W. Fossil footprints from the Grand Canyon. 41 pp. 20 January 1926.
- 80 3 2917 Gilmore, Charles W. Fossil footprints from the Grand Canyon: Second contribution. 78 pp. 30 July 1927.
- 80 8 2956 Gilmore, Charles W. Fossil footprints from the Grand Canyon: Third contribution. 16 pp. 28 January 1928.
- 81 8 3010 Metcalf, Maynard M. Parasites and the aid they give in problems of taxonomy, geographical distribution, and paleogeography. 36 pp. 28 February 1929.
- 82 16 3110 Reese, Albert M. The ductless glands of Alligator mississippiensis. 14 pp. 9 March 1931.
- 89 1 3181 Schmidt, Karl Patterson. Amphibians and reptiles collected by the Smithsonian Biological Survey of the Panama Canal Zone. 20 pp. 16 March 1933
- 91 11 3243 Chitwood, B. G. Two new nematodes. 4 pp. 13 April 1934.

- 92 7 3259 Cochran, Doris M. Herpetological collections from the West Indies made by Dr. Paul Bartsch under the Walter Rathbone Bacon Scholarship, 1928-30. 47 pp. 15 October 1934.
- 98 16 3541 McIntosh, Allen. A new dicrocoeliid trematode collected on the Presidential Cruise of 1938. 2 pp. 8 June 1939.
- 99 16 3602 Gilmore, Charles W. New fossil lizards from the Upper Cretaceous of Utah. 3 pp. 9 December 1940.
- 99 19 3629 Smith, Hobart M. Notes on Mexican snakes of the genus Geophis. 6 pp. 19 February 1941.
- 99 20 3630 Smith, Hobart M. Further notes on Mexican snakes of the genus Salvadora. 12 pp. 21 February 1941.
- 101 2 3638 Mittleman, M. B. and Harry G. M. Jopson. A new salamander of the genus Gyrinophilus from the southern Appalachians. 5 pp. 14 July 1941.
- 102 3646 Vasquez de Espinoza, Antonio. Compendium and description of the West Indies. 862 pp. 1 September 1942. (Translated by Charles Upson Clark from original 17th Century manuscript. Spanish Edition is Vol. 108)
- 106 4 3848 Cochran, Doris M. Notes on the herpetology of the Pearl Islands, Panama. 8 pp. 24 June 1946.
- 106 8 3852 Schmidt, Karl Patterson. Turtles collected by the Smithsonian Biological Survey of the Panama Canal Zone. 9 pp. 1 August 1946.
- 106 13 3857 Gilmore, Charles W. A new carnivorous dinosaur from the Lance Formation of Montana. 19 pp. 12 September 1946.
- 106 19 3867 Reese, Albert M. The lamina terminalis and preoptic recess in Amphibia. 9 pp. 27 January 1947.
- 117 17 4096 Mittleman, M. B. A generic synopsis of the lizards of the subfamily Lygosominae. 35 pp. 4 November 1952.
- 123 7 4181 Fries, Carl, Jr., Claude W. Hibbard and David H. Dunkle. Early Cenozoic vertebrates in the red conglomerate at Guanajuato, Mexico. 25 pp. 17 February 1955.

- 139 1 4372 Peabody, Frank E. The oldest known reptile,  
Eosauravus copei Williston. 13 pp. 7 May 1959.
- 151 2 4666 Rand, A. Stanley and Patricia J. Rand. Aspects of  
 the ecology of the iguanid lizard Tropidurus  
torquatus at Belem, Para. 16 pp. 8 July 1966.

## UNITED STATES NATIONAL MUSEUM BULLETIN

No. 1 - No. 298  
 (1875 - 1971)

No.

- 1 Cope, E.D. Check-list of North American Batrachia and Reptilia; with a systematic list of the higher groups, and an essay on geographical distribution. Based on the specimens contained in the U.S. National Museum. 1-104 pp. 1875.
- 6 Goode, G. Brown. Classification of the collection to illustrate the animal resources of the United States. A list of the substances derived from the animal kingdom, with synopsis of the useful and injurious animals and a classification of the methods of capture and utilization. xiii + 126 pp. 1876.
- 7 Streets, Thomas H. Contributions to the natural history of the Hawaiian and Fanning Islands and Lower California, made in connection with the United States North Pacific Surveying Expedition. 1873-75. Pp. 1-172. 1877.
- 14 Goode, G. Brown. Catalogue of the collection to illustrate the animal resources and the fisheries of the United States, exhibited at Philadelphia in 1876 by the Smithsonian Institution and the United States Fish Commission... xvi + 351 pp. 1879.
- 17 Cope, E.D. On the zoological position of Texas. Pp. 1-51. 1880.
- 19 Scudder, Samuel H. Nomenclator Zoologicus. An alphabetical list of all generic names that have been employed by naturalists for recent and fossil animals from the earliest times to the close of the year 1879. I. Supplemental List II. Universal Index. xxi + 376 & 340 pp. 1882.
- 20 Goode, George Brown. Bibliographies of American Naturalists. I. The published writing of Spencer Fullerton Baird, 1843-1882. xvi + 377 pp. 1883.
- 24 Yarrow, H.C. Check list of North American Reptilia and Batrachia, with catalogue of specimens in the U.S. National Museum. v + 249 pp. 1882 (1883 on front cover).

- 25 Jones, J. Matthew & G. Brown Goode, eds. Contributions to the natural history of the Bermudas. Pt. 6 Reptiles by Samuel Garman. xxiii + 353 pp. (285-303). 1884.
- 32 Cope, E.D. Catalogue of batrachians and reptiles of Central America and Mexico. ii + 98 pp. 1887.
- 34 Cope, E.D. The Batrachia of North America. Pp. 1-525. 1889.
- 39 Stejneger, Leonhard. Directions for collecting and preserving specimens. Pt. E. Directions for collecting reptiles and batrachians. [with supplementary note giving directions for preserving small herpetological specimens in formalin]. Pp. 1-13. 1891.
- 41 Goode, George Brown. Bibliographies of American naturalists. V. The published writings of Dr. Charles Girard. vi + 141 pp. 1891.
- 53 Merrill, George P. Catalogue of the type and figured specimens of fossils, minerals, rocks and ore in the Department of Geology, United States National Museum. Part II. Fossil vertebrates, fossil plants; minerals, rocks and ores. 370 pp. (pp. 63-81). 1907.
- 58 Stejneger, Leonhard. Herpetology of Japan and adjacent territory. xx + 577 pp. 22 July 1907.
- 61 Ruthven, Alexander G. Variations and genetic relationships of the garter-snakes. xii + 201 pp. 24 June 1908.
- 89 Gilmore, Charles Whitney. Osteology of the armored Dinosauria in the United States National Museum with special reference to the genus Stegosaurus. xi + 143 pp. 31 December 1914.
- 110 Gilmore, Charles Whitney. Osteology of the carnivorous Dinosauria in the United States National Museum, with special reference to the genera Antrodemus (Allosaurus) and Ceratosaurus. xi + 159 pp. 9 September 1920.
- 114 Blanchard, Frank N. A revision of the king snakes: Genus Lampropeltis. vi + 260 pp. 15 September 1921.
- 120 Metcalf, Maynard M. The opalinid ciliate infusorians. vii + 484 pp. 9 June 1923.
- 151 Loveridge, Arthur. East African reptiles and amphibians in the United States National Museum. v + 135 pp. 31 December 1929.
- 154 Burt, Charles E. A study of the teiid lizards of the genus Cnemidophorus with special reference to their phylogenetic relationships. viii + 286 pp. 24 April 1931.

- 160 Kellogg, Remington. Mexican tailless amphibians in the United States National Museum. iv + 224 pp. 19 May 1932.
- 171 Gidley, James W. & C. Lewis Gazin. The Pleistocene vertebrate fauna from Cumberland Cave, Maryland. vi + 99 pp. 5 May 1938.
- 175 Stull, Olive Griffith. Variations and relationships in the snakes of the genus Pituophis. vi + 225 pp. 26 June 1940.
- 177 Cochran, Doris M. The herpetology of Hispaniola. vii + 398 pp. 8 July 1941.
- 187 Smith, Hobart M. & Edward H. Taylor. An annotated checklist and key to the snakes of Mexico. iv + 239 pp. 5 October 1945.
- 194 Smith, Hobart M. & Edward H. Taylor. An annotated checklist and key to the amphibia of Mexico. iv + 118 pp. 17 or 18 June 1948.
- 199 Smith, Hobart M. & Edward H. Taylor An annotated checklist and key to the reptiles of Mexico exclusive of the snakes. v + 253 pp. 16 or 20 October 1950.
- 206 Cochran, Doris M. Frogs of Southeastern Brazil. xvi + 423 pp. 22 June 1955.
- 220 Cochran, Doris M. Type specimens of reptiles and amphibians in the U.S. National Museum. xv + 291 pp. 24 April 1961.
- 288 Cochran, Doris M. & Coleman J. Goin. Frogs of Colombia. xii + 655 pp. 6 July 1970.
- 297 Peters, James A. & Braulio Orejas-Miranda. Catalogue of the Neotropical Squamata. Part I. Snakes. viii + 347 pp. Peters, James A. & Roberto Donoso-Barros. Catalogue of the Neotropical Squamata. Part II. Lizards and amphisbaenians. viii + 293 pp. 24 February 1970. [Reprinted with updates as a single volume by Smithsonian Inst. Press in 1986]

## PROCEEDINGS OF THE UNITED STATES NATIONAL MUSEUM

Vol. 1 - Vol. 125  
(1878 - 1968)Publ.  
Vol. No. No.

- 4 199 Carlin, William E. Observations on Siredon lichenoides. Pp. 120-121. 2 June 1881 (18 July 1881).
- 4 245 Shufeldt, R.W. Remarks upon the osteology of Opheosaurus ventralis. Pp. 392-400. 10 April 1882 (25 April 1882).
- 4 249 True, Frederick W. On the North American land tortoises of the genus Xerobates. Pp. 434-449. 6-13 May 1882 (18 May 1882).
- 5 276 Carbonnier, M. Note on the habits and the rearing of the axolotl, Ambystoma mexicanum. Pp. 221-222. 25 July 1882 (5 August 1882). (Translated by Tarleton H. Bean).
- 5 299 Yarrow, H.C. Descriptions of new species of reptiles and amphibians in the United States National Museum. Pp. 438-443. 29 September 1882 (11 November 1882).
- 6 7-9 353 Stearns, W.A. Notes on the natural history of Labrador. Pp. 111-137. 27 July-20 September 1883 (27 September 1883).
- 6 10 359 Yarrow, H.C. Description of new species of reptiles in the United States National Museum. Pp. 152-154. 5 October 1883 (11 October 1883).
- 6 27 396 Walker, S.T. On the origin of the fossil bones discovered in the vicinity of Tise's Ford, Florida. Pp. 427-429. 10 August 1883 (11 April 1884).
- 8 14 512 Hay, O.P. Description of a new species of Ambystoma (Ambystoma copeianum) from Indiana. Pp. 208-213. 8 June 1885 (24 July 1885).
- 8 15 515 Beyer, H.G. The influence of variations of temperature upon the rate and the work of the heart of the slider terrapin (Pseudemys rugosa). Pp. 225-229. 13 July 1885 (29 July 1885).
- 8 (Appendix) Lucas, Frederick A. Notes on the preparation of rough skeletons. Pp. 679-686. 1885 (also circular # 33).

Vol.	Publ. No.	
9	559	Ferrari-Perez, Fernando. Catalogue of animals collected by the Geographical and Exploring Commission of the Republic of Mexico. III. Reptiles with descriptions of new species by E. D. Cope. Pp. 182-199. "28 September 1886" (Pp. 182-192, published 2 October 1886; pp. 193-199, 22 October 1886).
10	615	Cope, E.D. On a new species of <u>Tropidonotus</u> found in Washington. P. 146. 2 July 1887.
10	623	Townsend, C.H. Field-notes on the mammals, birds and reptiles of northern California. Pp. 159-241. 2 July 1887.
10	645	Cope, E.D. List of the Batrachia and Reptilia of the Bahama Islands. Pp. 436-439. 3 November 1887.
11	678	Dugès, A. Description of <u>Storeria dekayi</u> , var. <u>anomala</u> . Pp. 9-10. 8 November 1888. (The new name is misspelled in the title but correctly spelled <u>anomala</u> in the figure caption.)
11	689	Cope, E.D. On a new species of <u>Charina</u> from California. P. 88. 8 November 1888. (Illustration on pl. accompanying No. 729)
11	715	Cope, E.D. On a new species of <u>Bufo</u> from Texas. Pp. 317-318. 5 July 1889.
11	727	Cope, E.D. On the snakes of Florida. Pp. 381-394. 5 July 1889.
11	728	Cope, E.D. Catalogue of Batrachia and Reptilia brought by William Taylor from San Diego, Tex. Pp. 395-398. 5 July 1889.
11	729	Cope, E.D. On the Eutaeniae of southeastern Indiana. Pp. 399-401. 5 July 1889.
12	766	Stejneger, Leonhard. Description of two new species of snakes from California. Pp. 95-99. 5 February 1890.
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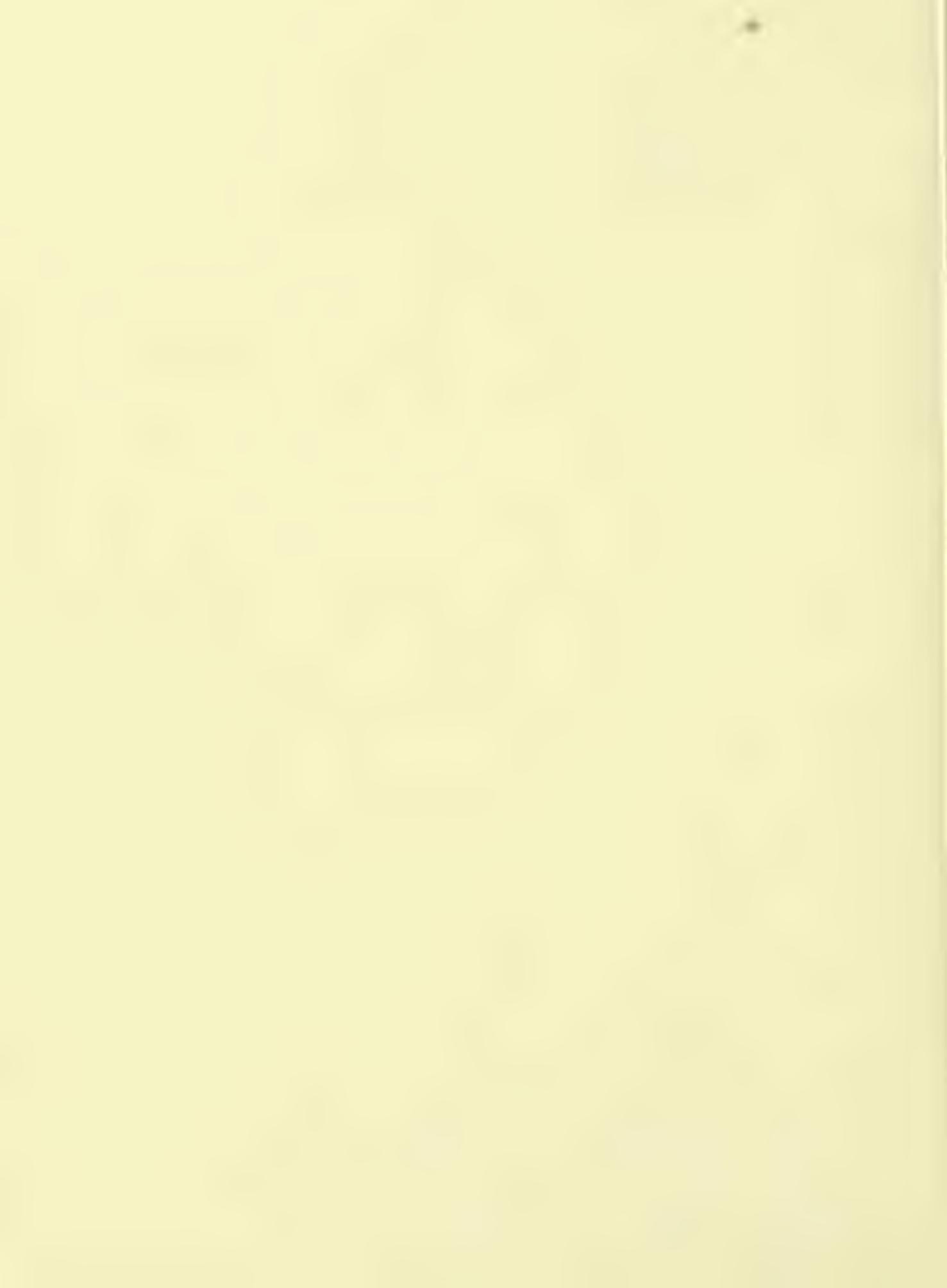
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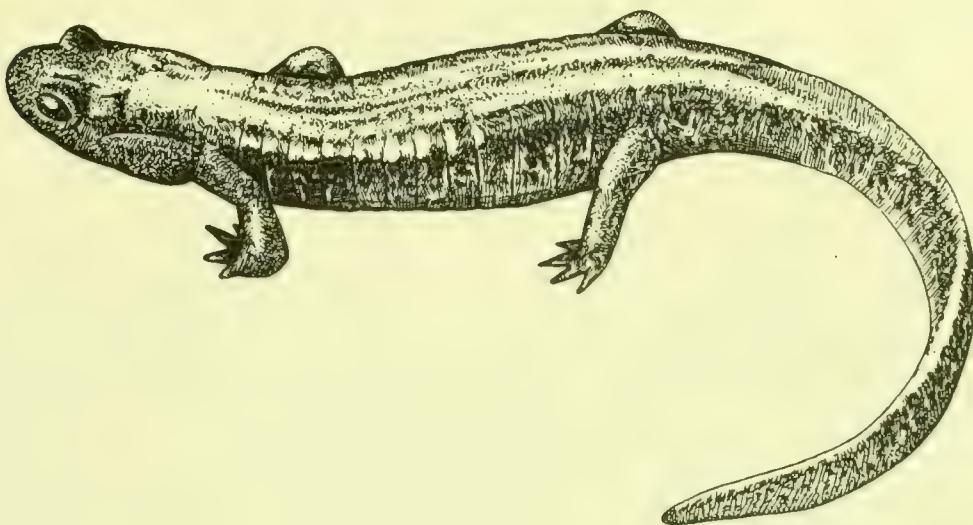
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**BIBLIOGRAPHY OF THE SIBERIAN NEWT  
(*SALAMANDRELLA KEYSERLINGII* DYBOWSKI, 1870)**



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Russian Academy of Science

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Cover illustration of Salamandrella keyserlingii by N. V. Panteleev.

## INTRODUCTION

The Siberian newt (Salamandrella keyserlingii Dybowski, 1870) is in some respects a unique amphibian. It is a member of the most primitive amphibian family, the Hynobiidae, and is of interest from a phylogenetic viewpoint. This newt occurs in arctic, subarctic, and temperate regions, living in a variety of habitats from tundra to steppe. Its geographic range is one of the largest among amphibians and stretches from the east and north of European Russia eastward to Chukotka, Kamchatka, Sakhalin, and Hokkaido, and from the Yakutian tundras southwards to central Mongolia, Manchuria, and northern Korea. Astonishingly, with such a large range, this newt has not differentiated into any distinct geographic populations. All subspecific and specific forms proposed for S. keyserlingii have eventually proved to be invalid.

Morphological, ecological, and geographical peculiarities of the Siberian newt make it an important object of biological studies. To now, it has been mentioned in more than 700 publications. This massive literature requires a summary, and a two volume monograph **Siberian Newt: Morphological Description of the Species** is being published by Nauka, a Moscow publisher. This monograph summarizes the published and unpublished data of 42 researchs authors on different aspects of the newt's biology. This monograph issue is not a complete survey of all publications on this species, rather it provides a detailed overview of its biology. Hence a complete bibliographic survey, encompassing two centuries, seems a useful adjunct to the monograph.

Owing to the species distribution, most publications have been written in Russian, Chinese, and Japanese, thus unknown and inaccessible to most western biologists. Further, much of the research was published in limited editions and/or serials of limited distribution. So that, the publications are frequently little known even in the country of their publication. Some of these works are of high scientific value.

I faced several difficulties in compiling this bibliography. First, some sources are quite rare. Fortunately, many were traced and examined during my 12-year bibliographic search. Nevertheless, a few items remained unavailable; the pages and subject matter of these are not included with their citations since I could not confirm these data. Second is the goal of bibliographic completeness. For future information needs, the list is as complete as possible and includes even single notes referring to the species. Third has been the problem of

bibliographic standardization for all languages with nonLatin alphabets. The standardization depended upon the transliterations provided by the libraries of Russia and other countries with nonLatin alphabets

Since the majority of the references is in Russian, Russian publications are not specially marked in the bibliography. All references in other languages are marked by asterisks (\*). If these references are in Bashkirian, Chinese, Czech, Japanese, Korean, Mongolian, Polish, or Ukrainian, the titles are enclosed in parentheses. English, French, or German references are not so marked.

All the titles in languages using the Latin alphabet are given in their original form. Titles in other languages are either translated or given English transcriptions; in the latter family and geographic names are also transcribed if another transcription had not been established earlier. Translated titles are enclosed in brackets. If the original publication source provided an English, French or German translation of the titles, these translated titles are not enclosed in brackets. When a summary or abstract is present in one of these languages, it is indicated in parentheses. Parentheses are also used for a published translation of an article.

The titles of books and dissertations are transcribed in English; their translations are enclosed in brackets. In few cases, Czech, Chinese, and Japanese titles are given only in translation. Editors of collected papers are not indicated.

Russian use three terms for amphibians and reptiles: "gady"; "zemnovodnye & presmykayushchiesya"; and "amfibii & reptilii". The two first terms are translated herein as "amphibians & reptiles", the third one as "Amphibia & Reptilia".

To make the bibliography more functional, references are coded by the following subjects: A, activity; B, behavior; C, conservation; D, diseases; E, ecology (ED, development; EE, natural enemies; EF, feeding; EH, habitats; EM, mortality; EP, population and number; ER, reproduction); G, geographic distribution; H, history of studies; K, karyology; M, morphology (MC, circulatory system; MD, digestive system; ME, external morphology; MG, glands; MI, integument; MK, kidney; MN, nervous system and sense organs; MO, eggs and eggsacs; MP, pulmonary system; MR, reproductive system; MS, skeletal and muscular systems); O, ontogenesis or embryology; P, physiology; PA, parasitology; PH, phylogeny including paleontology; PO, popular literature; S, systematics; T, terrarium or captive care; W, wintering or hibernation.

If a reference contains only singular mention of the Siberian newt, but not detailed information, the subject codes are followed by "(S)", e.g.: ME;ER;W(S). Similarly, in reference of a popular nature, the code "PO" is placed at the end. Perusal of the bibliography shows that most references are concerned with distribution, external morphology, skeletal and muscular anatomy, habitats, reproduction and development. The bibliography attempts to include all items published before 1993. Some later references are included.

#### Acknowledgements

I thank O. V. Kolobaeva (Institute of Evolutionary Morphology and Ecology of Animals Russian Academy of Sciences) for technical assistance; Dr. T. Sato (Obihiro Centennial City Museum, Japan) for generously providing a bibliography and copies of Japanese works published after the WW II and T. N. Sidorova (Institute of Evolutionary Morphology and Ecology of Animals Russian Academy of Sciences) for the translation of some Japanese references.

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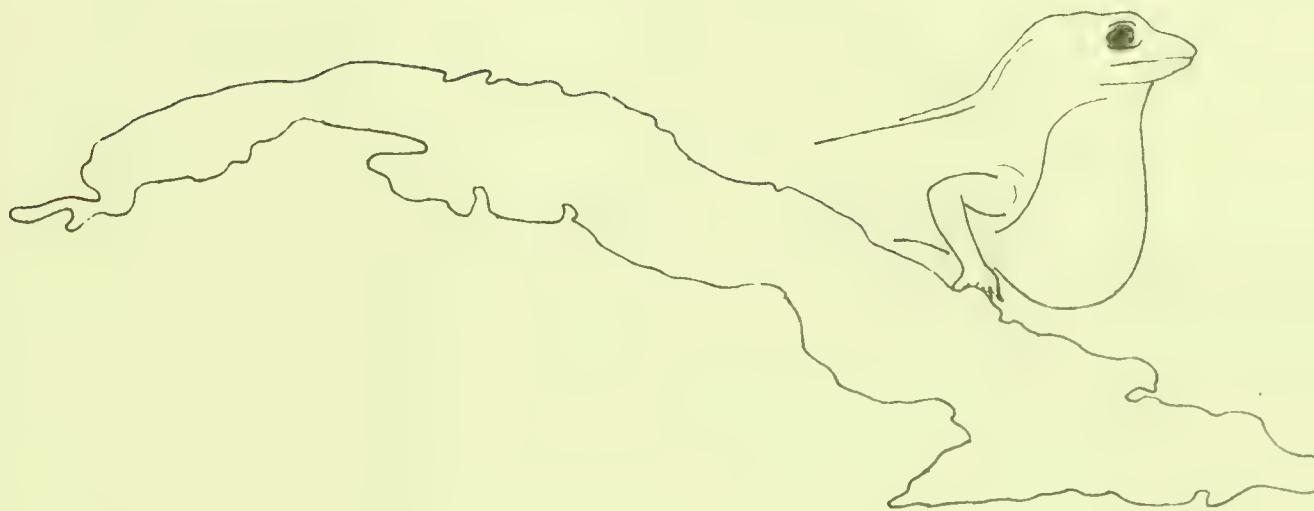






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CHECKLIST AND BIBLIOGRAPHY (1837-1991)  
OF  
CUBAN IGUANID LIZARDS



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## INTRODUCTION

The terrestrial reptile fauna of Cuba consists of 106 species described to date, of which 55 (51.8%) belong to the family Iguanidae. The family Iguanidae contains a total of 125 taxa, including subspecies.

Frost and Etheridge (1989, *Misc. Publ. Mus. Nat. Hist.*, Univ. Kansas 81:1-65) recommended that the eight generic groups of the family Iguanidae be recognized as distinct families. However, for the present review, I prefer to consider the Cuban species as one group in order to keep the information together.

In Cuba, the iguanids occur in many different terrestrial habitats from the coastal zones to the highest elevations in mountains, in natural, agricultural, and urban areas. However, forest of diverse types shelter the majority of the species (80%). All ecomorphs described by Williams (1983, pp. 326-370 In Harvard University Press, Cambridge) are represented, although the trunk-ecomorphs are the most frequent (67.3%). Only five species are not Cuban endemics; 12, 25, and 13 species are national, regional and local endemics, respectively.

The bibliography of the Cuban iguanids deals, in a great part, with taxonomy and geographical distribution. There are many papers in which the species of a given region are listed and some data about their habitats are presented. In another group of studies, several ecological aspects at the population or community level are presented and in a very few, a zoogeographical approach of the group is found.

Lists and catalogues are scarce. On the other hand, in the more recent ones (Garrido and Jaume, 1984; Schwartz and Henderson, 1988), the species are presented in alphabetical order, which makes it difficult to recognize their taxonomic affinities and five taxa have been described since the publication of the Schwartz and Henderson catalogue.

The present checklist contains the 125 taxa described up to 1991 from Cuba, and the bibliography encompasses all the references that I have found referring to about any aspect of Cuban iguanids, whether formally published or presented at symposia or as a theses.

Among the authors listed in the Bibliography, are some ones who have contributed in a greater manner than others. They are, in an alphabetical order, Thomas Barbour, Mario S. Buide, Georgina Espinosa López, Alberto Estrada, Orlando H. Garrido, Lourdes Rodríguez Schettino and Albert Schwartz.

As with any checklist from a area with a diverse fauna, the list is quickly out of date because some species are in editorial process, and others remain to be discovered, this list constitutes a basic guide, and the bibliography offers an introductory source for the herpetologists interested in Cuban iguanids.

#### ACKNOWLEDGMENTS

Many people has contributed to my knowledge of the Cuban iguanids, specially Mario S. Buide and Orlando H. Garrido from who I received the first papers about this interesting group.

Since I started to compile and arrange the literature presented here, I have relied on the valuable cooperation of Alcides Sampedro and the support of Oscar Cejudo and Eduardo Alvarez of the library of the Institute of Zoology and Mercedes Vega of the library of the Institute of Ecology and Systematics, both of the Academy of Sciences of Cuba.

The manuscript has been reviewed by Alcides Sampedro, Alberto Coy, Mercedes Martínez, Ada Chamizo, Julio Novo, Luis Moreno, Laredo González, Hiram González, Esteban Godínez, and Luis de Armas, although the taxonomic arrangement and any error or involuntary omission are my responsibility.

I thank all of the above for their help and collaboration.

REPTILIA  
LACERTILIA  
IGUANIDAE

(Endemic taxa are marked by an asterisk)

Genus Anolis Daudin, 1802

Section Etheridge, 1960

Subsection carolinensis

Series carolinensis

Group equestris

Anolis equestris Merrem, 1820\*

A. e. equestris Merrem, 1820\*

A. e. thomasi Schwartz, 1958\*

A. e. buidei Schwartz & Garrido, 1972\*

A. e. persparsus Schwartz & Garrido, 1972\*

A. e. juraguensis Schwartz & Garrido, 1972\*

A. e. verreonensis Schwartz & Garrido, 1972\*

A. e. potior Garrido, 1975\*

A. e. cincolequas Garrido, 1981\*

Anolis luteoocularis Noble & Hassler, 1935\*

A. l. luteoocularis Noble & Hassler, 1935\*

A. l. hassleri Barbour & Shreve, 1935\*

A. l. nivevultus G. Peters, 1970\*

A. l. delacruzi Schwartz & Garrido, 1972\*

A. l. sectilis Schwartz & Garrido, 1972\*

A. l. coctilis Schwartz & Garrido, 1972\*

A. l. calceus Schwartz & Garrido, 1972\*

A. l. jaumei Schwartz & Garrido, 1972\*

A. l. sanfelipensis Garrido, 1975\*

Anolis noblei Barbour & Shreve, 1935\*

A. n. noblei Barbour & Shreve, 1935\*

A. n. galeifer Schwartz, 1964\*

Anolis smallwoodi Schwartz, 1964\*

A. s. smallwoodi Schwartz, 1964\*

A. s. palardis Schwartz, 1964\*

A. s. saxuliceps Schwartz, 1964\*

Anolis baracoae Schwartz, 1964\*

Anolis piqmaequestris Garrido, 1975\*

Group carolinensis

Superspecies carolinensis

Anolis porcatus Gray, 1840\*

Anolis isolepis (Cope), 1861\*

A. i. isolepis (Cope), 1861\*

A. i. altitudinalis Garrido, 1985\*

Anolis allisoni Barbour, 1928

Superspecies angusticeps

- Anolis angusticeps Hallowell, 1856
- A. a. angusticeps Hallowell, 1856\*
- Anolis paternus Hardy, 1966\*
- A. p. paternus Hardy, 1966\*
- A. p. pinarensis Garrido, 1975\*
- Anolis quazuma Garrido, 1983\*

Group argillaceus

- Anolis loysiana Duméril & Bibron, 1837\*
- Anolis argillaceus Cope, 1862\*
- Anolis centralis G. Peters, 1970\*
- A. c. centralis G. Peters, 1970\*
- A. c. litoralis Garrido, 1975\*
- Anolis pumilus Garrido, 1988\*

Series lucius

Group lucius

- Superspecies lucius
- Anolis lucius Duméril & Bibron, 1837\*
- Anolis argenteolus Cope, 1861\*

Group vermiculatus

- Anolis vermiculatus Duméril & Bibron, 1837\*
- Anolis bartschi (Cochran), 1928\*

Series alutaceus

Group alutaceus

- Superspecies alutaceus
- Anolis alutaceus Cope, 1861\*
- Anolis clivicola Barbour & Shreve, 1935\*
- Anolis anfiloquioi Garrido, 1980\*
- Anolis inexpectata Garrido & Estrada, 1989\*
- Anolis cyanopleurus Cope, 1861\*
- A. c. cyanopleurus Cope, 1861\*
- A. c. orientalis Garrido, 1975\*
- Anolis cupeyalensis Garrido, 1975\*
- Anolis mimus Garrido, 1975\*
- Anolis fugitivus Garrido, 1975\*
- Anolis juangundlachi Garrido, 1975\*
- Superspecies spectrum

- Anolis spectrum W. Peters, 1863\*
- Anolis vanidicus Garrido & Schwartz, 1972\*
- A. v. vanidicus Garrido & Schwartz, 1972\*
- A. v. rejectus Garrido & Schwartz, 1972\*

Section Etheridge, 1960

Series sagrai

Group sagrai

Superspecies sagrai

- Anolis sagrai Duméril & Bibron, 1837
- A. s. sagrai Duméril & Bibron, 1837
- A. s. greyi Barbour, 1914\*

Anolis bremeri Barbour, 1914\*

A. b. bremeri Barbour, 1914\*

A. b. insulaepinorum Garrido, 1972\*

Superspecies homolechis

Anolis homolechis (Cope), 1864\*

A. h. homolechis (Cope), 1864\*

A. h. turquinensis Garrido, 1973\*

A. quadriocellifer Barbour & Ramsden, 1919\*

A. jubar Schwartz, 1968\*

A. j. jubar Schwartz, 1968\*

A. j. cuneus Schwartz, 1968\*

A. j. balaenarum Schwartz, 1968\*

A. j. oriens Schwartz, 1968\*

A. j. yaquajayensis Garrido, 1973\*

A. j. gibarensis Garrido, 1973\*

A. j. maisiensis Garrido, 1973\*

A. j. albertschwartzii Garrido, 1973\*

A. j. santamariae Garrido, 1973\*

A. j. cocoensis Estrada & Garrido, 1990\*

Anolis mestrei Barbour & Ramsden, 1916\*

Superspecies alloquus

Anolis alloquus Barbour & Ramsden, 1919\*

Anolis ahli Barbour, 1925\*

Anolis delafuentei Garrido, 1982\*

Anolis rubribarbus Barbour & Ramsden, 1919\*

Anolis imias Ruibal & Williams, 1961\*

Anolis birama Garrido, 1991\*

Anolis confusus Estrada & Garrido, 1991\*

Anolis guafe Estrada & Garrido, 1991\*

Anolis ophiolepis Cope, 1861\*

Genus Cyclura Harlan, 1824

Cyclura nubila (Gray), 1831

C. n. nubila (Gray), 1831\*

Genus Chamaeleolis Cocteau, 1838\*

Chamaeleolis chamaeleonides Duméril & Bibron, 1837\*

Chamaeleolis porcus Cope, 1864\*

Chamaeleolis barbatus Garrido, 1982\*

Chamaeleolis quamuhaya Garrido, Pérez-Beato & Moreno, 1991\*

Genus Leiocephalus Gray, 1827

Leiocephalus carinatus Gray, 1827

L. c. carinatus Gray, 1827\*

L. c. aquarius Schwartz & Ogren, 1956\*

L. c. zayasi Schwartz, 1959\*

L. c. mogotensis Schwartz, 1959\*

L. c. labrossytus Schwartz, 1959\*

L. c. cayensis Schwartz, 1959\*

- L. c. microcyon Schwartz, 1959\*
- Leiocephalus cubensis (Gray), 1840\*
- L. c. cubensis (Gray), 1840\*
  - L. c. paraphrus Schwartz, 1959\*
  - L. c. gigas Schwartz, 1959\*
  - L. c. pambasileus Schwartz, 1959\*
  - L. c. minor Garrido, 1970\*
- Leiocephalus macropus Cope, 1862\*
- L. m. macropus Cope, 1862\*
  - L. m. inmaculatus Hardy, 1958\*
  - L. m. hoplites Zug, 1959\*
  - L. m. hyacinthurus Zug, 1959\*
  - L. m. koopmani Zug, 1959\*
  - L. m. aeqialus Zug, 1959\*
  - L. m. phylax Schwartz & Garrido, 1967\*
  - L. m. asbolomus Schwartz & Garrido, 1967\*
  - L. m. lenticulatus Garrido, 1973\*
  - L. m. felinoi Garrido, 1979\*
  - L. m. torrei Garrido, 1979\*
- Leiocephalus raviceps Cope, 1862\*
- L. r. raviceps Cope, 1862\*
  - L. r. uzzelli Schwartz, 1960\*
  - L. r. klinikowskii Schwartz, 1960\*
  - L. r. jaumei Schwartz & Garrido, 1968\*
  - L. r. delavarai Garrido, 1973\*
- Leiocephalus stictigaster Schwartz, 1959\*
- L. s. stictigaster Schwartz, 1959\*
  - L. s. sierrae Schwartz, 1959\*
  - L. s. exotheotus Schwartz, 1959\*
  - L. s. astictus Schwartz, 1959\*
  - L. s. lucianus Schwartz, 1960\*
  - L. s. paraspheX Schwartz, 1964\*
  - L. s. ophiplacodes Schwartz, 1964\*
  - L. s. naranjoi Schwartz & Garrido, 1968\*
  - L. s. lipomator Schwartz & Garrido, 1968\*
  - L. s. celeutes Schwartz & Garrido, 1968\*
  - L. s. gibarensis Schwartz & Garrido, 1968\*
  - L. s. septentrionalis Garrido, 1975\*
- Leiocephalus onaneyi Garrido, 1973\*

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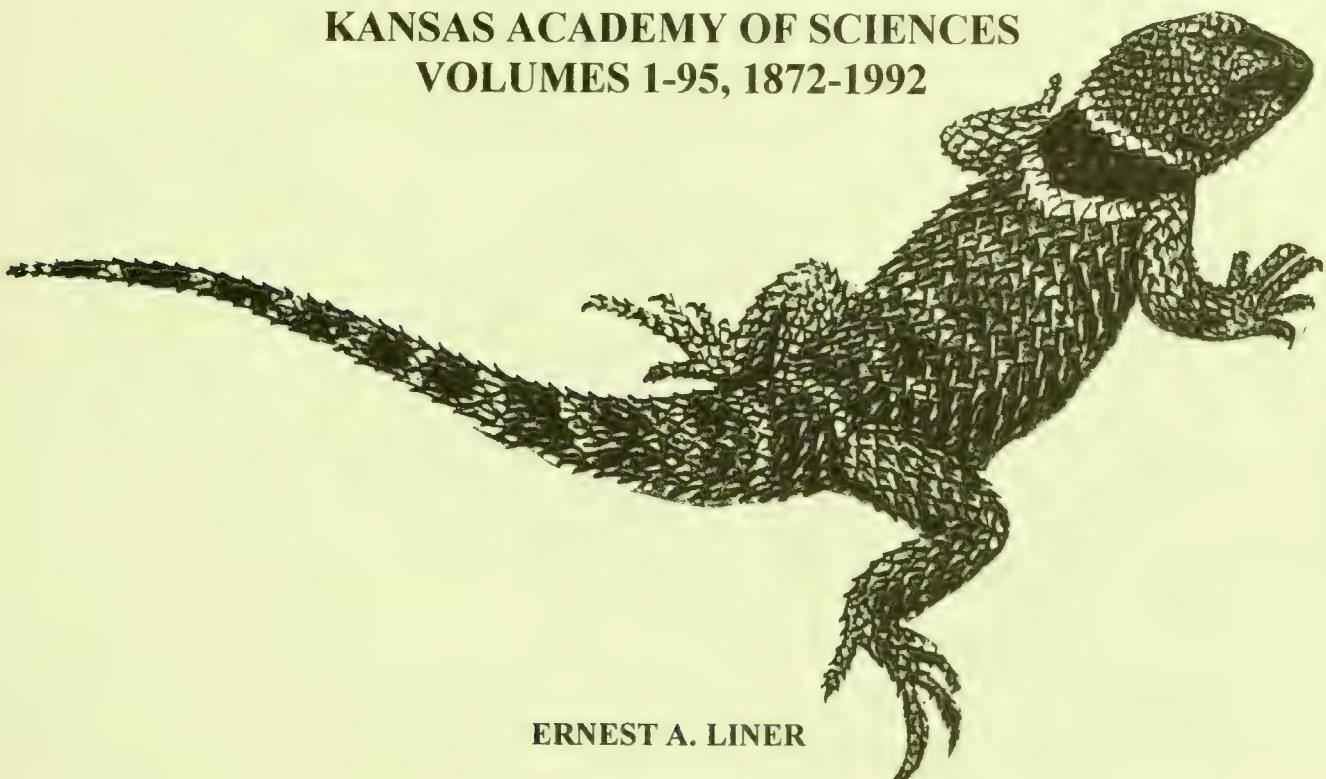






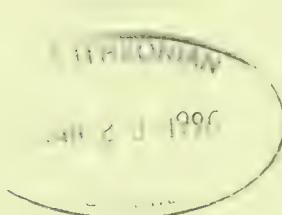
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**BIBLIOGRAPHY AND SCIENTIFIC NAME INDEX  
TO  
AMPHIBIANS AND REPTILES  
OF THE  
TRANSACTIONS OF THE  
KANSAS ACADEMY OF SCIENCES  
VOLUMES 1-95, 1872-1992**



**ERNEST A. LINER**

**Houma, Louisiana**



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## INTRODUCTION

The present alphabetical bibliography by author (s) consists of all the herpetological papers published in this series in the first 95 volumes, 1872-1992. All junior authors are listed alphabetically and cross referenced to the senior author. All articles with original herpetological names are preceded by an \*. Abs. after a title indicates that it is an abstract only.

The scientific name index consists of all the herpetological names used and referenced to the article (s) where used. There are two exceptions to this. In Smith, Hobart M. and Rozella B. Smith 1970; 73 (2): 302-318 the names used in Mosauer's bibliography are not included but the names in the text of the article are. In Brame, A. H., R. Hochadel, H. M. Smith and R. B. Smith 1978; 81 (1): 43-56 a complete list of all the known salamanders of the world was given. This list was not included as it would really serve no useful purpose. Only the first page number of an article is given. All original names are boldfaced. No names used in literature cited sections are included. All original spellings have been maintained except those that ended in i or ii. When both appeared ii is used.

In addition to the Transactions the academy put out as a special publication an "Index (Table of Contents) Transactions Kansas Academy of Science, Volumes 1-33 (1872-1930)" and again "A Bibliography and Index of Transactions Kansas Academy of Science, Volumes 1-65 (1872-1962) by Walter H. Schoewe" that could be of interest to herpetologists. They are not in the main bibliography or the scientific name index. This bibliography and index updates those publications.

The author wishes to thank C. Gans for suggesting this project. For suggesting the addition of a scientific name index G. R. Zug and W. R. Heyer.

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**CHECKLIST AND BIBLIOGRAPHY  
OF THE  
LIZARDS OF VIETNAM**



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Russian Academy of Sciences



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## INTRODUCTION

Owing to a number of reasons the lizard fauna of Vietnam to now remains poorly studied. The unpublished manuscript of R.Bourret (1942-1947) provided the foundation for subsequent studies, but it is now considerably out of date.

The present checklist includes all species recorded for Vietnam and described through October 1993. Of the 97 recorded taxa, 11.3 % have been described in the last 10 years.

The accompanying bibliography covers the period 1829-1993. Under each subject heading is listed an author's name followed by the date for reference to a more complete citation in the literature section at the end of the article. In the Species Index section the name in the parentheses after author's name and date is the name used in the referenced paper. Subject headings and explanations of the topics included under each are:

**D e s c r i p t i o n :** includes references containing any information about diagnosis, anatomy, morphology, descriptive material.

**S y n o n y m y :** includes references containing partial or complete synonymies. Taxonomic names in parentheses are those used by the authors.

**D i s t r i b u t i o n :** includes references containing any geographical information on range, distribution, and collecting sites.

**H a b i t a t :** includes references to habitat type and/or any environmental factor including altitude.

**B e h a v i o u r :** includes references to general behaviour, activity, breeding, courtship, feeding.

**K e y s   a n d   s y n o p s e s :** includes references to partial or complete keys, and checklists.

## ACKNOWLEDGMENTS

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## CHECKLIST

## Family GEKKONIDAE

1. \**Cnemaspis boulengeri* Strauch, 1887
2. *Cosymbotus platyurus* (Schneider, 1797)
3. \**Cyrtodactylus condorensis* (Smith, 1920)
4. *Cyrtodactylus intermedius* Smith, 1917
5. \**Cyrtodactylus irregularis* (Smith, 1921)
6. *Cyrtodactylus philippinicus* (Steindachner, 1867)
7. *Gehyra fehlmani* (Taylor, 1962)
8. *Gehyra laceratus* (Taylor, 1962)
9. *Gehyra mutilata* (Wiegmann, 1835)
10. *Gekko badenii* Szczerbak and Nekrasowa, 1993
11. *Gekko chinensis* Gray, 1842
12. *Gekko gecko* (L., 1758)
13. *Gekko japonicus* (Schlegel, 1836)
14. *Gekko palmatus* Boulenger, 1907
15. \**Gekko ulikovskii* Darevsky and Orlov, in Press
16. *Goniurosaurus lichtenfelderi* (Mocquard, 1897)
17. *Hemidactylus bowringii* (Gray, 1845)
18. *Hemidactylus frenatus* Schlegel, 1836
19. *Hemidactylus stejnegeri* Ota and Hikida, 1989
20. *Hemidactylus vietnamensis* Darevsky and Kupriyanova, 1984
21. \**Hemiphyllodactylus chapaensis* (Bourret, 1937)
22. *Lepidodactylus lugubris* (Dumeril and Bibron, 1836)
23. *Phyllodactylus melanostictus* Taylor, 1962
24. *Phyllodactylus siamensis* Boulenger, 1898
25. *Ptychozoon lionatum* (Annandale, 1905)

## Family DIBAMIDAE

26. *Dibamus bourreti* Angel, 1935
27. \**Dibamus greeri* Darevsky, 1992
28. \**Dibamus montanus* Smith, 1921
29. \**Dibamus smithi* Greer, 1985

Family *AGAMIDAE*

30. *Acanthosaura capra* Guenther, 1861
31. *Acanthosaura crucigera* Boulenger, 1885
32. *Acanthosaura lepidogaster* (Cuvier, 1829)
33. *Bronchocela smaragdina* Guenther, 1864
34. *Calotes emma* Gray, 1845
35. *Calotes mystaceus* Dumeril and Bibron, 1837
36. *Calotes versicolor* (Daudin, 1802)
37. *Draco blanfordi indochinensis* (Smith, 1928)
- 38a. *Draco maculatus haasei* (Boettger, 1893)
- 38b. *Draco maculatus whiteheadi* (Boulenger, 1899)
39. *Draco volans* L., 1758
40. \**Japalura chapaensis* (Bourret, 1937)
41. \**Japalura fasciata* Mertens, 1926
42. *Japalura yunnanensis* Anderson, 1879
43. *Leiolepis belliana* (Gray, 1827)
44. \**Leilepis guentherpetersi* Darevsky and Kupriyanova, 1993
45. *Leilepis guttata* Cuvier, 1829
46. *Leilepis reevesii* (Gray, 1831)
47. *Physignathus cocincinus* Cuvier, 1829
48. *Pseudocalotes fruhstorferi* (Werner, 1904)
49. *Pseudocalotes microlepis* (Boulenger, 1887)

Family *SCINCIDAE*

50. *Ateuchosaurus chinensis* Gray, 1845
51. *Dasia olivacea* Gray, 1839
52. *Emoia atrocostata* Lesson, 1826
53. \**Emoia laobaoense* Bourret, 1937
54. *Eumeces chinensis* (Gray, 1838)
55. *Eumeces elegans* Boulenger, 1887
56. *Eumeces quadrilineatus* (Blyth, 1853)
57. \**Eumeces tamdaoensis* Bourret, 1937
58. *Lipinia vittigerum microcercum* (Boettger, 1901)
59. *Lygosoma albopunctata* (Gray, 1846)
60. \**Lygosoma angeli* (Smith, 1937)
61. *Lygosoma bowringii* (Guenther, 1864)
62. \**Lygosoma corpulenta* Smith, 1921

63. *Lygosoma punctata* (Gmelin, 1799)
64. *Lygosoma quadrupes* (L., 1766)
65. \**Mabuya chapaensis* (Bourret, 1937)
66. \**Mabuya darevskii* Bobrov, 1992
67. *Mabuya longicaudata* (Hallowell, 1853)
68. *Mabuya macularia* (Blyth, 1853)
69. *Mabuya multifasciata* (Kuhl, 1820)
70. \**Saiphos poilani* Bourret, 1937
71. \**Saiphos tridigitum* Bourret, 1939
72. *Scincella doriae* (Boulenger, 1887)
73. *Scincella melanosticta* (Boulenger, 1887)
74. *Scincella reevesii* (Gray, 1838)
75. \**Scincella rufocaudatus* (Darevsky and Nguyen, 1983)
76. \**Sphenomorphus buenloicus* Darevsky and Nguyen, 1983
77. *Sphenomorphus indicus* (Gray, 1853)
78. *Sphenomorphus maculatus* (Blyth, 1853)
79. *Sphenomorphus malayanus* (Doria, 1888)
80. *Sphenomorphus stellatus* (Boulenger, 1900)
81. \**Sphenomorphus tritaeniatus* (Bourret, 1937)
82. \**Tropidophorus baviensis* Bourret, 1937
83. *Tropidophorus berdmorei* (Blyth, 1853)
84. \**Tropidophorus cocincinensis* Dumeril and Bibron, 1839
85. \**Tropidophorus cucphuongensis* Bobrov, in Press
86. *Tropidophorus hainanus* Smith, 1923
87. *Tropidophorus microlepis* Guenther, 1861
88. *Tropidophorus sinicus* Boettger, 1886
89. \**Vietnascincus rugosus* Darevsky and Orlov, 1994

#### Family ANGUIDAE

90. *Ophisaurus gracilis* (Gray, 1845)
91. *Ophisaurus harti* Boulenger, 1899
92. *Ophisaurus ludovici* Mocquard, 1905
93. \**Ophisaurus sokolovi* Darevsky and Nguyen, 1983

#### Family LACERTIDAE

94. *Tachydromus sexlineatus ocellatus* Cuvier, 1829
95. *Tachydromus wolteri* Fischer, 1885

## Family VARANIDAE

96. *Varanus bengalensis nebulosus* (Gray, 1831)  
 97. *Varanus salvator* (Laurenti, 1786)

\* - endemic species

## KEYS AND SYNOSES

Pope, 1935 (China and Northern Vietnam); Smith, 1935 (India, Burma and Indochina); Bourret, 1939d (French Indochina); 1943b (French Indochina); Mertens, 1959 (Indoaustralian *Varanus*); Taylor, 1963 (Thailand, and particularly Vietnam); Peters, 1971 (*Leiolepis*); Dao, 1979 (Vietnam); Dring, 1979 (Asiatic *Cnemaspis*); Inger, Brown, 1980 (*Dasia*); Darevsky, Nguyen, 1983 (Asiatic *Ophisaurus*, Vietnamese *Sphenomorphus*); Musters, 1983 (*Draco*); Ouboter, 1983 (Asiatic *Scincella*); Greer, 1985 (*Dibamus*); Brown, 1991 (*Emoia*); Darevsky, 1992a (Chinese and Vietnamese *Dibamus*); Bobrov, 1992c (Vietnamese *Mabuya*), 1993a (Vietnam), Darevsky, Kupriyanova, 1993 (*Leiolepis*); Zhao, Adler, 1993 (China); Bobrov, in Press (Indochinese *Tropidophorus*).

## SPECIES INDEX

### GEKKONIDAE

#### *Cnemaspis boulengeri*

Description. Strauch, 1887; Smith, 1921a (*Gonatodes glaucus*), 1935

Synonymy. Smith, 1935

Distribution. Strauch, 1887; Smith, 1921a, 1935; Nguyen, Ho, 1979; Darevsky, 1990; Darevsky et al., 1991

Habitat. Darevsky et al., 1991

#### *Cosymbotus platyurus*

Description. Smith, 1935 (*Platyurus platyurus*); Bourret, 1944 (*Platyurus platyurus*); Bobrov, 1992a

Synonymy. Smith, 1935

Distribution. Morice, 1875 (*Nycteridium schneideri*); Tirant, 1885 (*Nycteridium schneideri*); Strauch, 1887 (*Hemidactylus platyurus*); Smith, 1935; Bourret, 1944;

Darevsky et al., 1986; Darevsky, 1990; Bobrov, 1992a; Nekrasowa, Szczerbak, 1993  
**Habitat.** Smith, 1935; Bobrov, 1992a

*Cyrtodactylus condorensis*

**Description.** Smith, 1921a (*Gymnodactylus condorensis*), 1935 (*Gymnodactylus condorensis*)

**Synonymy.** Smith, 1935

**Distribution.** Smith, 1921a, 1935

*Cyrtodactylus irregularis*

**Description.** Smith, 1921b (*Gymnodactylus peguensis* var. *irregularis*), 1935  
(*Gymnodactylus irregularis*).

**Synonymy.** Smith, 1935

**Distribution.** Smith, 1935; Ho, Nguyen, 1981.

*Cyrtodactylus intermedius*

**Description.** Smith, 1935 (*Gymnodactylus intermedius*); Bobrov, 1992a.

**Synonymy.** Smith, 1935 (*Gymnodactylus intermedius*)

**Distribution.** Bobrov, 1992a.

**Habitat.** Bobrov, 1992a

*Cyrtodactylus philippinicus*

**Distribution.** Strauch, 1887 (*Gymnodactylus philippinicus*)

*Gehyra fehlmanni*

**Distribution.** Nekrasowa, Szczerbak, 1993.

*Gehyra laceratus*

**Distribution.** Nekrasowa, Szczerbak, 1993.

*Gehyra mutilata*

**Description.** Smith, 1935; Bourret, 1937a, 1944

**Synonymy.** Smith, 1935

**Distribution.** Morice, 1875 (*Peripia peronii*); Tirant, 1885 (*Peripia peroni*);  
Strauch, 1887 (*Peripia mutilata*); Boettger, 1901; Schmidt, 1928 (*Peropus mutilata*);  
Smith, 1935; Bourret, 1937a, 1944; Darevsky, 1990; Nekrasowa, Szczerbak, 1993

*Gekko badenii*

**Distribution.** Nekrasowa, Szczerbak, 1993.

*Gekko chinensis*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937b, 1939b, 1943a

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Smith, 1935; Bourret, 1937b, 1939b, c, 1943a; Tran et al., 1981;  
Darevsky et al., 1986; Darevsky, 1990; Bobrov, 1993b

**H a b i t a t .** Darevsky et al., 1986; Bobrov, 1993b

**B e h a v i o u r .** Darevsky et al., 1986

*Gekko gecko*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937a, b, 1939a, 1943a, 1944

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875 (*guttatus*); Tirant, 1885 (*guttatus*); Strauch, 1887  
(*verticillatus*); Pavie, 1904 (*verticillatus*); Smith, 1921a (*verticillatus*), 1935; Angel,  
1928 (*verticillatus*); Bourret, 1937a, b, 1939a,c, 1943a, 1944; Petzold, 1962; Le, 1971;  
Nguyen, 1975, 1985, 1988; Nguyen, Ho, 1979; Ho, Nguyen, 1981; Tran et al., 1981;  
Darevsky et al., 1986; Nguyen et al., 1988; Darevsky, 1990; Bobrov, 1992a 1993b,:  
Nekrasowa, Szczerbak, 1993

**H a b i t a t .** Smith, 1935; Nguyen, 1975, 1988; Darevsky et al., 1986; Bobrov, 1992a,  
1993b

**B e h a v i o u r .** Smith, 1935; Nguyen, 1988

*Gekko japonicus*

**D e s c r i p t i o n .** Bourret, 1937a

**D i s t r i b u t i o n .** Bourret, 1937a; Tran et al., 1981

*Gekko palmatus*

**D e s c r i p t i o n .** Boulenger, 1907; Smith, 1935

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Boulenger, 1907; Smith, 1935; Ota, Weidenhofer, 1990

*Gekko ulikovskii*

**D e s c r i p t i o n .** Darevsky, Orlov, in Press

**D i s t r i b u t i o n .** Darevsky, Orlov, in Press

*Goniurosaurus lichtenfelderi*

**D e s c r i p t i o n .** Mocquard, 1897 (*Eublepharis lichtenfelderi*); Smith, 1935 (*Eublepharis*  
*lichtenfelderi*)

**S y n o n y m y .** Pope, 1935 (*Eublepharis lichtenfelderi*); Smith, 1935 (*Eublepharis*  
*lichtenfelderi*)

**Distribution.** Mocquard, 1897; Pope, 1935 (*Eublepharis lichtenfelderi*); Smith, 1935 (*Eublepharis lichtenfelderi*); Tran et al., 1981 (*Eublepharis lichtenfelderi*).

**Habitat.** Smith, 1935 (*Eublepharis lichtenfelderi*)

*Hemidactylus bowringii*

**Description.** Smith, 1935; Bourret, 1939a; Darevsky et al., 1984; Bobrov, 1992a

**Synonymy.** Smith, 1935

**Distribution.** Smith, 1935; Bourret, 1939a; Ho, Nguyen, 1981; Tran et al., 1981; Darevsky et al., 1986; Darevsky, 1990; Bobrov, 1992a

**Habitat.** Smith, 1935; Bobrov, 1992a

*Hemidactylus frenatus*

**Description.** Smith, 1935; Bourret, 1937a, b, 1944; Darevsky et al., 1984; Bobrov, 1992a

**Synonymy.** Smith, 1935

**Distribution.** Morice, 1875; Tirant, 1885; Strauch, 1887; Boettger, 1901; Parker, 1925; Angel, 1928 (*karenorum*); Schmidt, 1928; Smith, 1935; Bourret, 1937a, b, 1944; Dao, 1960, 1962, 1966 (*karenorum*); Petzold, 1962; Johnson, 1970; Le, 1971 (*karenorum*); Nguyen, 1975; Nguyen, Ho, 1979; Ho, Nguyen, 1981; Tran et al., 1981; Darevsky et al., 1986; Darevsky, 1990; Bobrov, 1992a, b, 1993b; Nekrasowa, Szczerbak, 1993

**Habitat.** Dao, 1966; Johnson, 1970; Bobrov, 1992a, b, 1993b **Behaviour.** Dao, 1966; Bobrov, 1992b

*Hemidactylus stejnegeri*

**Distribution.** Darevsky, 1990; Ota et al., 1993

*Hemidactylus vietnamensis*

**Description.** Smith, 1935 (*garnoti*); Bourret, 1941b (*garnoti*); Darevsky et al., 1984

**Synonymy.** Pope, 1935 (*garnoti*); Smith, 1935 (*garnoti*)

**Distribution.** Pope, 1935 (*garnoti*); Bourret, 1941b; Petzold, 1962 (*garnoti*); Nguyen, Ho, 1979 (*garnoti*); Ho, Nguyen, 1981 (*garnoti*); Tran et al., 1981 (*garnoti*); Darevsky et al., 1984; 1986

*Hemiphyllodactylus chapaensis*

**Description.** Bourret, 1937b (*typus chapaensis*), 1941b (*typus chapaensis*), 1944

**Distribution.** Bourret, 1937b, 1939,c (*typus chapaensis*), 1941b, 1944; Tran et al., 1981; Ota, Weidenhofer, 1990 (*typus*)

*Lepidodactylus lugubris***D e s c r i p t i o n .** Smith, 1935**S y n o n y m y .** Smith, 1935**D i s t r i b u t i o n .** Smith, 1935; Darevsky, 1990*Phyllodactylus melanostictus***D e s c r i p t i o n .** Bobrov, 1992a**D i s t r i b u t i o n .** Bobrov, 1992a**H a b i t a t .** Bobrov, 1992a*Phyllodactylus siamensis***D e s c r i p t i o n .** Smith, 1935**S y n o n y m y .** Smith, 1935**D i s t r i b u t i o n .** Smith, 1935; Ho, Nguyen, 1981; Nekrasowa, Szczerbak, 1993*Ptychozoon lionatum***D e s c r i p t i o n .** Smith, 1935; Bourret, 1941a**S y n o n y m y .** Smith, 1935**D i s t r i b u t i o n .** Smith, 1935; Bourret, 1941a**H a b i t a t .** Smith, 1935**B e h a v i o u r .** Smith, 1935***DIBAMIDAE****Dibamus bourreti***D e s c r i p t i o n .** Angel, 1935; Darevsky, Nguyen, 1983; Greer, 1985; Darevsky, 1992**S y n o n y m y .** Greer, 1985; Darevsky, 1992**D i s t r i b u t i o n .** Angel, 1935; Ho, Nguyen, 1981; Tran et al., 1981; Darevsky, Nguyen, 1983; Greer, 1985; Darevsky et al., 1986; Darevsky, 1990, 1992**H a b i t a t .** Darevsky, Nguyen, 1983*Dibamus greeri***D e s c r i p t i o n .** Darevsky, 1992**D i s t r i b u t i o n .** Darevsky, 1992**H a b i t a t .** Darevsky, 1992**B e h a v i o u r .** Darevsky, 1992*Dibamus montanus***D e s c r i p t i o n .** Smith, 1921b, 1935; Greer, 1985; Darevsky, 1992

**S y n o n y m y .** Smith, 1935; Greer, 1985; Darevsky, 1992

**D i s t r i b u t i o n .** Smith, 1921b, 1935; Ho, Nguyen, 1981; Greer, 1985; Darevsky, 1990 (*smithi*), 1992

**H a b i t a t .** Darevsky, 1992

*Dibamus smithi*

**D e s c r i p t i o n .** Greer, 1985; Darevsky, 1992

**D i s t r i b u t i o n .** Greer, 1985; Darevsky et al., 1991; Darevsky, 1992

**H a b i t a t .** Darevsky et al., 1991

*A G A M I D A E*

*Acanthosaura capra*

**D e s c r i p t i o n .** Smith, 1935 (*Goniocephalus capra*); Bourret, 1937a (*Goniocephalus capra*), 1939b (*Goniocephalus capra*)

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875; Smith, 1935 (*Goniocephalus capra*); Bourret, 1937a, 1939b; Ho, Nguyen, 1981

*Acanthosaura crucigera*

**D e s c r i p t i o n .** Smith, 1935 (*Goniocephalus armatus crucigera*)

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Smith, 1935; Ho, Nguyen, 1981

*Acanthosaura lepidogaster*

**D e s c r i p t i o n .** Cuvier, 1829 (*Calotes lepidogaster*); Dumeril et Bibron, 1837 (*Calotes tropidogaster*); Smith, 1935 (*Goniocephalus lepidogaster*); Bourret, 1937a (*Goniocephalus lepidogaster*), b (*Goniocephalus lepidogaster*), 1939a (*Goniocephalus lepidogaster*), b (*Goniocephalus lepidogaster*), 1941b (*Goniocephalus lepidogaster*), 1943a (*tropidogaster*)

**S y n o n y m y .** Dumeril et Bibron, 1837; Pope, 1935 (*Goniocephalus lepidogaster*); Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875; Parker, 1925 (*laminidentata*); Pope, 1935 (*Goniocephalus lepidogaster*); Smith, 1935; Bourret, 1937a, b, 1939a, b, c (*Goniocephalus lepidogaster*), 1941b, 1943a; Le, 1971 (*Goniocephalus lepidogaster*); Nguyen, 1975 (*Goniocephalus lepidogaster*); Ho, Nguyen, 1981; Tran et al., 1981 (*Goniocephalus lepidogaster*); Darevsky et al., 1986 (*tropidogaster*); Darevsky, 1990 (*Gonocephalus lepidogaster*); Bobrov, 1993b

**H a b i t a t .** Bobrov, 1993b

*Bronchocela smaragdina*

**D e s c r i p t i o n .** Smith, 1935 (*Calotes smaragdinus*); Bourret, 1939a (*Calotes smaragdinus*)

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875; Smith, 1935; Bourret, 1939a; Ho, Nguyen, 1981 (*Calotes smaragdina*); Bobrov, 1992a (*Calotes smaragdinus*)

**H a b i t a t .** Bobrov, 1992a

*Calotes emma*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937a, b, 1941b

**S y n o n y m y .** Pope, 1935; Smith, 1935

**D i s t r i b u t i o n .** Parker, 1925; Angel, 1928; Pope, 1935; Smith, 1935; Bourret, 1937a, b, 1941b; Dao, 1960, 1962; Le, 1971; Tran et al., 1981; Darevsky, 1990; Darevsky et al., 1991

**H a b i t a t .** Smith, 1935; Darevsky et al., 1991

*Calotes mystaceus*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937b, 1939a, 1941a, 1944; Bobrov, 1992a

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875; Pavie, 1904; Smith, 1921b, 1935; Bourret, 1937b, 1939a, 1941a, 1944; Ho, Nguyen, 1981; Tran et al., 1981; Nguyen, 1985; Nguyen et al., 1988; Bobrov, 1992a

**H a b i t a t .** Smith, 1935; Bobrov, 1992a

**B e h a v i o u r .** Smith, 1935

*Calotes versicolor*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937a, 1943a, 1944; Bobrov, 1992a

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875; Boettger, 1901; Smith, 1921a, 1935; Angel, 1928; Schmidt, 1928; Bourret, 1937a, 1943a, 1944; Dao, 1957, 1960, 1962; Johnson, 1970; Le, 1971; Nguyen, Ho, 1979; Ho, Nguyen, 1981; Tran et al., 1981; Darevsky, 1990; Bobrov, 1992a, 1993b

**H a b i t a t .** Smith, 1935; Johnson, 1970; Bobrov, 1992a, 1993b

**B e h a v i o u r .** Smith, 1935

*Draco blanfordi indochinensis*

**D e s c r i p t i o n .** Smith, 1928 (*indochinensis*), 1935 (*indochinensis*); Musters, 1983; Bobrov, 1992a

**S y n o n y m y .** Smith, 1935; Musters, 1983

**D i s t r i b u t i o n .** Smith, 1928, 1935; Ho, Nguyen, 1981; Musters, 1983; Bobrov, 1992a

Habitat. Bobrov, 1992a

*Draco maculatus*

Description. Smith, 1935; Bourret, 1939b, 1943a; Musters, 1983

Synonymy. Smith, 1935; Musters, 1983

Distribution. Morice, 1875; Tirant, 1885; Angel, 1928; Smith, 1921a, 1935; Bourret, 1939b, 1943a; Le, 1971 (*sp.*); Tran et al., 1981; Musters, 1983; Darevsky, 1990; Bobrov, 1993b

Habitat. Bobrov, 1993b

*Draco volans*

Description. Musters, 1983

Synonymy. Musters, 1983

Distribution. Ho, Nguyen, 1981; Tran et al., 1981; Musters, 1983

*Japalura chapaensis*

Description. Bourret, 1939a (*swinhonis chapaensis*) 1941b; Ota, 1989

Synonymy. Ota, 1989

Distribution. Bourret, 1939a, c (*swinhonis chapaensis*), 1941b; Tran et al., 1981 (*swinhonis chapaensis*); Ota, 1989

*Japalura fasciata*

Description. Mertens, 1926; Smith, 1935; Ota, 1989

Synonymy. Smith, 1935

Distribution. Mertens, 1926; Smith, 1935; Bourret, 1939c; Tran et al., 1981

*Japalura yunnanensis*

Description. Ota, 1989

Distribution. Ota, Weidenhofer, 1990

*Leiolepis belliana*

Description. Smith, 1935; Peters, 1971; Darevsky, Kupriyanova, 1993

Synonymy. Smith, 1935; Peters, 1971; Darevsky, Kupriyanova, 1993

Distribution. Smith, 1935; Bourret, 1937b, 1944; Peters, 1971; Darevsky, Kupriyanova, 1993

Habitat. Smith, 1935

Behaviour. Smith, 1935

*Leiolepis guentherpetersi*

**Description.** Darevsky, Kupriyanova, 1993

**Synonymy.** Darevsky, Kupriyanova, 1993

**Distribution.** Darevsky, Kupriyanova, 1993

*Leiolepis guttata*

**Description.** Cuvier, 1829; Smith, 1935 (*belliana guttata*); Peters, 1971; Darevsky, Kupriyanova, 1993

**Synonymy.** Smith, 1935; Peters, 1971; Darevsky, Kupriyanova, 1993

**Distribution.** Morice, 1875; Pavie, 1904 (*belli*); Smith, 1921b (*belliana var. annamensis*); 1935; Bourret, 1937a (*belliana guttata*); Peters, 1971; Ho, Nguyen, 1981 (*belli*); Darevsky, Kupriyanova, 1993

**Habitat.** Smith, 1935;

**Behaviour.** Smith, 1935;

*Leiolepis reevesii*

**Description.** Peters, 1971; Darevsky, Kupriyanova, 1993

**Synonymy.** Peters, 1971; Darevsky, Kupriyanova, 1993

**Distribution.** Boettger, 1901(*belli*); Schmidt, 1928 (*belli*); Smith, 1935(*belliana*); Bourret, 1937a (*belliana*); Dao, 1957(*belliana*), 1960(*belliana*); Peters, 1971; Tran et al., 1981(*belliana*); Ngo, Dang, 1986 (*belliana belliana*, b. *guttatus*); Darevsky et al., 1986; Darevsky, Kupriyanova, 1993

**Habitat.** Ngo, Dang, 1986

**Behaviour.** Ngo, Dang, 1986

*Physignathus cocincinus*

**Description.** Cuvier, 1829; Guerin-Meneville, 1838 (*Isiturus cochinsinensis*); Gray, 1831 (*Lophura cuvieri*); Dumeril et Bibron, 1837 (*Istiurus physignathus*); Barbour, 1912 (*caudicinctus*); Smith, 1935; Bourret, 1937a, b, 1944

**Synonymy.** Gray, 1831; Guerin-Meneville, 1829-1839; Dumeril et Bibron, 1837; Pope, 1935; Smith, 1935

**Distribution.** Morice, 1875 (*mentager*); Tirant, 1885 (*mentager*); Barbour, 1912; Smith, 1923, 1935; Parker, 1925 (*mentager*); Angel, 1928; Schmidt, 1928; Pope, 1935; Bourret, 1937a, b, 1944; Le, 1971; Nguyen, 1975; Nguyen, Ho, 1979; Ho, Nguyen, 1981; Tran et al., 1981

**Habitat.** Smith, 1935

**Behaviour.** Smith, 1935

*Pseudocalotes fruhstorferi*

**D e s c r i p t i o n .** Werner, 1904 (*Acanthosaura fruhstorferi*, *Calotes brevipes*); Smith, 1935 (*Calotes fruhstorferi*); Bourret, 1941b (*Calotes fruhstorferi*), 1943a (*Calotes fruhstorferi*)

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Werner, 1904; Smith, 1935; Bourret, 1939c (*Calotes fruhstorferi*), 1941b, 1943a; Tran et al., 1981 (*Calotes fruhstorferi*)

*Pseudocalotes microlepis*

**D e s c r i p t i o n .** Smith, 1935 (*Calotes microlepis*)

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Smith, 1921b (*Calotes microlepis*), 1935; Tran et al., 1981 (*Calotes microlepis*)

*S C I N C I D A E*

*Ateuchosaurus chinensis*

**D e s c r i p t i o n .** Smith, 1935

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Smith, 1935; Bourret, 1939c; Tran et al., 1981

*Dasia olivacea*

**D e s c r i p t i o n .** Smith, 1935

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875 (*Euprepes olivaceus*); Tirant, 1885 (*Euprepes olivaceus*); Smith, 1921a (*Lygosoma olivacea*), 1935; Darevsky, 1990

*Emoia atrocostata*

**D e s c r i p t i o n .** Bourret, 1937a; Brown, 1991

**S y n o n y m y .** Brown, 1991

**D i s t r i b u t i o n .** Bourret, 1937a; Brown, 1991

**H a b i t a t .** Brown, 1991

*Emoia laobaoense*

**D e s c r i p t i o n .** Bourret, 1937a; Brown, 1991

**S y n o n y m y .** Brown, 1991

**D i s t r i b u t i o n .** Bourret, 1937a; Brown, 1991

**H a b i t a t .** Brown, 1991

*Eumeces chinensis*

**D e s c r i p t i o n .** Smith, 1935; Hikida, Darevsky, 1987

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Smith, 1935; Darevsky, 1990

**H a b i t a t .** Smith, 1935

*Eumeces elegans*

**D e s c r i p t i o n .** Bourret, 1937a; Hikida, Darevsky, 1987

**D i s t r i b u t i o n .** Bourret, 1937a; Tran et al., 1981

*Eumeces quadrilineatus*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937a; Hikida, Darevsky, 1987

**S y n o n y m y .** Pope, 1935; Smith, 1935

**D i s t r i b u t i o n .** Pope, 1935; Smith, 1935; Bourret, 1937a, 1939c; Tran et al., 1981; Darevsky et al., 1986; Hikida, Darevsky, 1987; Bobrov, 1993b

**H a b i t a t .** Bobrov, 1993b

*Eumeces tamdaoensis*

**D e s c r i p t i o n .** Bourret, 1937a, 1939a; Hikida, Darevsky, 1987

**D i s t r i b u t i o n .** Bourret, 1937a, 1939a, c; Tran et al., 1981; Darevsky et al., 1986; Hikida, Darevsky, 1987

*Lipinia vittigerum microcercum*

**D e s c r i p t i o n .** Boettger, 1901 (*Lygosoma microcercum*); Smith, 1922 (*Lygosoma vittigerum kronfanum*), 1935 (*Leilopisma vittigerum microcercum*)

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Boettger, 1901; Smith, 1922, 1935; Schmidt, 1928 (*Leilopisma vittigerum microcercum*); Ho, Nguyen, 1981 (*Leilopisma vittigerum microcercum*); Semenov et al., 1983 (*Leilopisma vittigerum microcercum*); Bobrov, 1992a

**H a b i t a t .** Semenov et al., 1983; Bobrov, 1992a

**B e h a v i o u r .** Semenov et al., 1983

*Lygosoma albopunctata*

**D e s c r i p t i o n .** Smith, 1935 (*Riopa albopunctata*)

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Tirant, 1885 (*Eumeces albopunctata*); Smith, 1935

*Lygosoma angeli*

**Description.** Smith, 1937 (*Riopa angeli*); Bobrov, 1992a (*Riopa angeli*)

**Distribution.** Smith, 1937; Bobrov, 1992a

**Habitat.** Bobrov, 1992a

*Lygosoma bowringii*

**Description.** Smith, 1935 (*Riopa bowringii*); Bourret, 1943a (*Riopa bowringii*)

**Synonymy.** Smith, 1935

**Distribution.** Morice, 1875 (*Eumeces bowringii*); Tirant, 1885 (*Eumeces bowringii*); Boettger, 1901; Smith, 1935; Bourret, 1943a; Darevsky, 1990 (*Riopa bowringii*)

**Habitat.** Smith, 1935

**Behaviour.** Smith, 1935

*Lygosoma corpulenta*

**Description.** Smith, 1921b (*Riopa corpulentum*); 1935 (*Riopa corpulenta*)

**Synonymy.** Smith, 1935

**Distribution.** Smith, 1935

**Habitat.** Smith, 1935

*Lygosoma punctata*

**Description.** Smith, 1935 (*Riopa punctata*)

**Synonymy.** Smith, 1935

**Distribution.** Smith, 1935; Bourret, 1939c (*Riopa punctata*); Tran et al., 1981 (*Riopa punctata*)

*Lygosoma quadrupes*

**Description.** Smith, 1935; Bourret, 1937a, b, 1941b, 1944

**Synonymy.** Smith, 1935

**Distribution.** Tirant, 1885 (*Eumeces chalcides*); Boettger, 1901 (*chalcides*); Schmidt, 1928 (*chalcides*); Bourret, 1937a, b, 1941b, 1944; Tran et al., 1981; Bobrov, 1992a

**Habitat.** Smith, 1935; Bobrov, 1992a

**Behaviour.** Smith, 1935

*Mabuya chapaensis*

**Description.** Bourret, 1937a (*Tiliqua chapaensis*), b (*Tiliqua chapaensis*), 1941b; Bobrov, 1992c

**Distribution.** Bourret, 1937a, b, 1939c, 1941b; Le, 1971; Nguyen, Ho, 1979; Ho, Nguyen, 1981; Tran et al., 1981; Semenov et al., 1983

*Mabuya darevskii*

Description. Bobrov, 1992c

Distribution. Bobrov, 1992c

Habitat. Bobrov, 1992c

*Mabuya longicaudata*

Description. Smith, 1935; Bourret, 1937a; Bobrov, 1992c

Synonymy. Smith, 1935

Distribution. Morice, 1875 (*Eumeces siamensis*); Tirant, 1885 (*Eumeces siamensis*); Parker, 1925 (*siamensis*); Schmidt, 1928; Smith, 1935; Bourret, 1937a; Dao, 1957 (*siamensis*); Petzold, 1962; Le, 1971; Nguyen, 1975; Tran et al., 1981; Darevsky et al., 1986; Darevsky, 1990; Ota, Weidenhofer, 1990

Habitat. Smith, 1935; Nguyen, 1975; Darevsky et al., 1986

*Mabuya macularia*

Description. Smith, 1935; Bobrov, 1992a,c

Synonymy. Smith, 1935

Distribution. Morice, 1875 (*Euprepes rufescens*); Tirant, 1885 (*Euprepes rufescens*); Boettger, 1901; Schmidt, 1928; Smith, 1935; Dao, 1962; Le, 1971; Nguyen, 1975; Ho, Nguyen, 1981; Tran et al., 1981; Semenov et al., 1983; Darevsky et al., 1986; Darevsky, 1990; Bobrov, 1992a

Habitat. Semenov et al., 1983; Bobrov, 1992a

Behaviour. Smith, 1935; Semenov et al., 1983

*Mabuya multifasciata*

Description. Smith, 1935; Bourret, 1937a, b, 1939a, b, 1941b, 1943a, 1944; Bobrov, 1992a, c

Synonymy. Smith, 1935

Distribution. Boettger, 1901; Pavie, 1904; Parker, 1925; Angel, 1928; Schmidt, 1928; Smith, 1935; Bourret, 1937a, b, 1939a, b, 1941b, 1943a, 1944; Petzold, 1962; Johnson, 1970; Le, 1971; Nguyen, 1975; Nguyen, Ho, 1979; Ho, Nguyen, 1981; Tran et al., 1981; Semenov et al., 1983; Nguyen, 1985; Darevsky et al., 1986; Nguyen et al., 1988; Darevsky, 1990; Darevsky et al., 1991; Bobrov, 1992a

Habitat. Smith, 1935; Johnson, 1970; Semenov et al., 1983; Darevsky et al., 1991; Bobrov, 1992a

Behaviour. Semenov et al., 1983

*Saiphos poilani*

**Description.** Bourret, 1937b, 1941b

**Distribution.** Bourret, 1937b, 1941b

*Saiphos tridigitum*

**Description.** Bourret, 1939b

**Distribution.** Bourret, 1939b

*Scincella doriae*

**Description.** Smith, 1935 (*Leilopisma doriae*); Bourret, 1939a (*Leilopisma doriae*); Ouboter, 1983; Bobrov, 1992a

**Synonymy.** Smith, 1935; Ouboter, 1983

**Distribution.** Smith, 1935; Bourret, 1939a, c (*Leilopisma doriae*); Ouboter, 1983; Bobrov, 1992a

**Habitat.** Bobrov, 1992a

*Scincella melanosticta*

**Description.** Smith, 1935 (*Leilopisma reevesii melanostictum*); Ouboter, 1983; Darevsky et al., 1986

**Synonymy.** Smith, 1935; Ouboter, 1983

**Distribution.** Smith, 1935; Ouboter, 1983; Darevsky et al., 1986; Darevsky, 1990

*Scincella reevesii*

**Description.** Smith, 1935 (*Leilopisma reevesii*); Bourret, 1937a (*Leilopisma ochraceum*), b, 1939a (*Leilopisma ochraceum*); Ouboter, 1983

**Synonymy.** Smith, 1935; Ouboter, 1983

**Distribution.** Smith, 1935; Bourret, 1937a, b, 1939a; Ouboter, 1983; Bobrov, 1993b

**Habitat.** Smith, 1935; Ouboter, 1983; Bobrov, 1993b

*Scincella rufocaudatus*

**Description.** Darevsky, Nguyen, 1983 (*Sphenomorphus rufocaudatus*)

**Distribution.** Darevsky, Nguyen, 1983; Nguyen, 1985 (*Sphenomorphus rufocaudatus*); Nguyen et al., 1988 (*Sphenomorphus rufocaudatus*); Darevsky, 1990; Darevsky et al., 1991

**Habitat.** Darevsky, Nguyen, 1983; Darevsky et al., 1991

*Sphenomorphus buenloicus*

**D e s c r i p t i o n .** Darevsky, Nguyen, 1983

**D i s t r i b u t i o n .** Darevsky, Nguyen, 1983; Nguyen, 1985

**H a b i t a t .** Darevsky, Nguyen, 1983

*Sphenomorphus indicus*

**D e s c r i p t i o n .** Smith, 1935 (*Lygosoma indicum*); Darevsky, Nguyen, 1983

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Schmidt, 1928; Smith, 1935; Tran et al., 1981 (*Lygosoma indicum*)

**H a b i t a t .** Smith, 1935

**B e h a v i o u r .** Smith, 1935

*Sphenomorphus maculatus*

**D e s c r i p t i o n .** Smith, 1935 (*Lygosoma maculatum*); Darevsky, Nguyen, 1983

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Smith, 1935; Darevsky, 1990; Darevsky et al., 1991

**H a b i t a t .** Smith, 1935; Darevsky et al., 1991

**B e h a v i o u r .** Smith, 1935

*Sphenomorphus malayanus*

**D e s c r i p t i o n .** Darevsky, Nguyen, 1983

**D i s t r i b u t i o n .** Tran et al., 1981 (*Lygosoma malayanus*)

*Sphenomorphus stellatus*

**D e s c r i p t i o n .** Boettger, 1901 (*Lygosoma annamiticum*); Smith, 1935 (*Lygosoma stellatum*); Darevsky, Nguyen, 1983

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Boettger, 1901; Smith, 1921b (*Lygosoma stellatum*), 1935; Ho, Nguyen, 1981; Darevsky, Nguyen, 1983

**H a b i t a t .** Smith, 1935; Darevsky, Nguyen, 1983

*Sphenomorphus tritaeniatus*

**D e s c r i p t i o n .** Bourret, 1937a (*Lygosoma tritaeniatum*); Darevsky, Nguyen, 1983; Darevsky et al., 1986

**D i s t r i b u t i o n .** Bourret, 1937a, 1939c (*Lygosoma tritaeniatus*); Tran et al., 1981 (*Lygosoma tritaeniatus*); Darevsky et al., 1986; Bobrov, 1993b

**H a b i t a t .** Bobrov, 1993b

*Tropidophorus baviensis*

**D e s c r i p t i o n .** Bourret, 1939a, 1941a; Darevsky, Nguyen, 1983

**D i s t r i b u t i o n .** Bourret, 1939a, 1941a; Tran et al., 1981; Darevsky, Nguyen, 1983; Darevsky et al., 1986; Bobrov, 1993b

**H a b i t a t .** Darevsky, Nguyen, 1983; Bobrov, 1993b

*Tropidophorus berdmorei*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937a, b, 1941b;

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Smith, 1935; Bourret, 1937a, b, 1939c, 1941b; Le, 1971; Ho, Nguyen, 1981; Tran et al., 1981; Nguyen, 1985; Darevsky et al., 1986

*Tropidophorus cocincinensis*

**D e s c r i p t i o n .** Dumeril et Bibron, 1839; Smith, 1935; Bourret, 1941b

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875; Tirant, 1885; Smith, 1935; Bourret, 1941b; Ho, Nguyen, 1981

*Tropidophorus cucphuongensis*

**D e s c r i p t i o n .** Bobrov, in Press

**D i s t r i b u t i o n .** Bobrov, 1993b (*Tropidophorus* sp.), in Press

**H a b i t a t .** Bobrov, 1993b (*Tropidophorus* sp.), in Press

*Tropidophorus hainanus*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937a, 1941b, 1943a

**S y n o n y m y .** Pope, 1935; Smith, 1935

**D i s t r i b u t i o n .** Pope, 1935; Smith, 1935; Bourret, 1937a, 1939c, 1941b, 1943a; Ho, Nguyen, 1981; Tran et al., 1981; Darevsky et al., 1986; Nguyen et al., 1988; Ota, Weidenhofer, 1990; Bobrov, 1993b

**H a b i t a t .** Bobrov, 1993b

*Tropidophorus microlepis*

**D e s c r i p t i o n .** Smith, 1935

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875; Tirant, 1885; Smith, 1935; Ho, Nguyen, 1981; Darevsky et al., 1986

**H a b i t a t .** Smith, 1935

*Tropidophorus sinicus*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937b, 1939a

**S y n o n y m y .** Pope, 1935; Smith, 1935

**D i s t r i b u t i o n .** Pope, 1935; Smith, 1935; Bourret, 1937b, 1939a, c; Tran et al., 1981

*Vietnascincus rugosus*

**D e s c r i p t i o n .** Darevsky, Orlov, 1994

**D i s t r i b u t i o n .** Darevsky, Orlov, 1994

*L A C E R T I D A E**Tachydromus sexlineatus ocellatus*

**D e s c r i p t i o n .** Duvernoy, 1836 (*ocellatus*); Smith, 1935; Bourret, 1937a, b

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Morice, 1875; Tirant, 1885 (*meridionalis*); Boettger, 1901; Pavie, 1904; Smith, 1935; Bourret, 1937a, b, 1939c; Nguyen, 1975; Ho, Nguyen, 1981; Tran et al., 1981; Nguyen, 1985; Darevsky et al., 1986; Darevsky, 1990; Bobrov, 1992a, 1993b,

**H a b i t a t .** Bobrov, 1992a, 1993b,

*Tachydromus wolteri*

**D i s t r i b u t i o n .** Nguyen, 1975; Tran et al., 1981; Darevsky et al., 1986

*A N G U I D A E**Ophisaurus gracilis*

**D e s c r i p t i o n .** Smith, 1935; Darevsky, Nguyen, 1983; Darevsky et al., 1986; Brygoo, 1987

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Smith, 1935; Darevsky et al., 1986; Brygoo, 1987

**H a b i t a t .** Smith, 1935

**B e h a v i o u r .** Smith, 1935

*Ophisaurus harti*

**D e s c r i p t i o n .** Smith, 1935; Bourret, 1937a, b, 1939a, b, 1941b, 1943a; Darevsky, Nguyen, 1983; Darevsky et al., 1986; Brygoo, 1987

**S y n o n y m y .** Smith, 1935

**D i s t r i b u t i o n .** Smith, 1935; Bourret, 1937a, b, 1939a, b, c, 1941b, 1943a; Tran et al., 1981; Darevsky et al., 1986; Brygoo, 1987

**B e h a v i o u r .** Smith, 1935

*Ophisaurus ludovici*

**Description.** Mocquard, 1905a, b; Brygoo, 1987

**Distribution.** Mocquard, 1905a, b; Brygoo, 1987

*Ophisaurus sokolovi*

**Description.** Campden-Main, 1970 (*gracilis*); Darevsky, Nguyen, 1983; Brygoo, 1987

**Distribution.** Campden-Main, 1970; Darevsky, Nguyen, 1983; Brygoo, 1987

**Habitat.** Campden-Main, 1970; Darevsky, Nguyen, 1983

**VARANIDAE***Varanus bengalensis nebulosus*

**Description.** Smith, 1935 (*nebulosus*); Bourret, 1937b (*nebulosus*), 1941b (*nebulosus*)

**Synonymy.** Smith, 1935 (*nebulosus*)

**Distribution.** Morice, 1875 (*nebulosus*); Tirant, 1885 (*nebulosus*); Smith, 1935 (*nebulosus*); Bourret, 1937b, 1941b; Nguyen, Ho, 1979 (*nebulosus*); Ho, Nguyen, 1981; Darevsky, 1990; Darevsky et al., 1991

**Habitat.** Smith, 1935 (*nebulosus*); Darevsky et al., 1991

**Behaviour.** Smith, 1935 (*nebulosus*)

*Varanus salvator*

**Description.** Smith, 1935; Bourret, 1937a, 1941b

**Synonymy.** Smith, 1935

**Distribution.** Morice, 1875 (*Hydrosaurus salvator*); Tirant, 1885 (*Hydrosaurus salvator*); Smith, 1935; Bourret, 1937a, 1939c, 1941b; Le, 1971; Nguyen, 1975; Nguyen, Ho, 1979; Ho, Nguyen, 1981; Tran et al., 1981; Nguyen et al., 1988; Bobrov, 1993b

**Habitat.** Smith, 1935; Bobrov, 1993b

**Behaviour.** Smith, 1935

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# KEYS TO THE KNOWN AMPHIBIANS AND REPTILES OF THE ROYAL CHITWAN NATIONAL PARK, NEPAL



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## INTRODUCTION

The Royal Chitwan National Park (RCNP) is an approximately 930 km<sup>2</sup> wildlife preserve centered at 27°30'N 84°20'E in the central Terai lowlands of Nepal. It lies between the outer range of the Himalayan Mountains (the Mahabharat Lekh) and the Nepalese-India border. The park consists of the Rapti Valley at elevations of 150-250 m and the Churia and Someswar Hills, collectively known as the Siwaliks, that range to about 650 m elevation. The Siwaliks roughly parallel the political border to the south. Maps of RCNP and descriptions of the ecology of the area have been published in Sunquist (1981), Laurie (1982), and Sunquist and Sunquist (1988).

The following keys to the known amphibians and reptiles of RCNP derive from keys originally included in a report submitted to the Nepalese Department of National Parks and Wildlife Conservation in 1986. The report was designed for use by park visitors and staff but was never published. Zug and Mitchell (1995) subsequently described the herpetofauna, provided an annotated checklist, and summarized natural history information available for the eleven frogs and 44 reptiles known to occur in RCNP. The following keys provide a means of identifying all the amphibians and reptiles of the park, and supplement Zug and Mitchell (1995). They are based on species descriptions in Smith (1931, 1935, 1943), Daniel (1983), Moll (1986a, 1986b), and our observations on specimens available.

## FROGS

1. a) Body and hindlimbs short and heavy; skin very rough, covered by numerous warts often tipped with tiny spines, dry in appearance ..... 2
- b) Body and hindlimbs elongate and usually slender; skin smooth or lightly ridged, distinctly moist ..... 3
2. a) Head with distinct bony ridges above eyes and along snout; many body warts capped with black spines ..... Bufo melanostictus
- b) Head without bony ridges; warts less numerous and not strikingly capped with spines ..... Bufo stomaticus
3. a) Tips of fingers and toes expanded into distinct digital pads or disks ..... Polypedates maculatus
- b) Tips of fingers and toes pointed or, at most, slightly expanded ..... 4
4. a) Fingers elongate and sharply pointed without webbing, first and second finger nearly as long as third and fourth; hindfeet fully webbed; back with scattering of small warts; olive brown dorsally with indistinct darker blotches ..... Rana cyanophlyctis
- b) Fingertips blunt, occasionally slightly expanded, 1st and 2nd fingers distinctly shorter than 3rd and 4th; if present dorsally, glandular tissue lies in short or long ridges ..... 5
5. a) Tan back with dark brown sides ..... Rana danieli
- b) Brown or green back with spots, stripes, or marbling ..... 6

6. a) Stout, toad-like in appearance; toes of hindfoot short, inner metatarsal tubercle flattened and longer than first toe ..... Tomopterna breviceps
- b) Slender body; toes of hindfoot long, inner metatarsal tubercle small to moderate in size and rounded ..... 7
7. a) Green with darker green spots on back, a whitish stripe in middle of back and another diagonal white stripe on each side of body; long glandular ridges ..... Rana tigerina group (R. crassa, R. tigerina)
- b) Brown, often with a narrow tan stripe down middle of back, and occasionally with orange or green blotches on nape; numerous short glandular ridges on back ..... Rana limnocharis group (R. limnocharis, R. pierrei, R. shadrensis)

#### CROCODILES

1. a) Snout broad, length 1.0-1.5 times width; dorsal scales in 16-17 transverse rows; maxillary teeth  $\leq$  19 .. Crocodylus palustris
- b) Snout narrow and long, length 3.0-5.5 times width; dorsal scales in 21-22 transverse rows; maxillary teeth  $>$  19 ..... Gavialis gangeticus

#### TURTLES

1. a) Bony shell covered with hard, keratinous epidermal plates (scutes); snout not formed into proboscis; neck and head not longer than shell ..... 3
- b) Shell covered with thick, skin-like layer with no indication of plates; nose elongated into proboscis; neck and head as long or longer than shell ..... 2

2. a) Head appears short with eyes very close to end of snout; snout length (proboscis) less than diameter of eye; neck broadly attached to shell ..... Chitra indica
- b) Head appears long with eyes in normal position, not close to snout; proboscis length  $\geq$  eye diameter; greenish head with 3 pairs of oblique black stripes on neck ..... Aspideretes gangeticus
3. a) Shell strongly domed; longitudinal ridges of carapace absent or, if present, number no more than three; terrestrial ..... 4
- b) Shell not strongly domed but slightly flattened; single median longitudinal ridge on shell; aquatic and semiaquatic ..... 6
4. a) Columnar hindlimbs and hindlimbs elephant-like; no distinct ridge on carapace; carapace brown and yellowish; no stripes on head or shell ..... Indotestudo elongata
- b) Hindlimbs not columnar, hindfeet flattened with elongate curved claws; carapacial ridge may be present ..... 5
5. a) Three distinct ridges on carapace; plum-colored carapace usually with three yellowish stripes; reddish stripe on head running through eye usually present; plastron plain yellow ..... Melanochelys tricarinata
- b) Carapace lacks ridges; dark brown to black carapace without stripes; no red stripe on head but yellowish reticulations may be present; plastron dark with a yellowish stripe on each side .... Melanochelys trijuga
6. a) Anterior margin of fourth vertebral scute in broad contact with posterior margin of third; upper jaw with

- medial notch and a cusp on each side; no pattern on plastron ..... 7
- b) Anterior margin of fourth vertebral narrowly contacts posterior margin of third; upper jaw without medial notch or cusps ..... Kachuga tecta
7. a) Second vertebral scute pointed posteriorly and fits into indentation on the anterior margin of the third vertebral scute; carapace with three distinct dark stripes ..... Kachuga dhongoka
- b) Second vertebral scute not pointed posteriorly; no indentation on anterior margin of third vertebral; carapace without distinct pattern ..... Kachuga kachuga
- LIZARDS**
1. a) Skin soft and tuberculate, body scales not evident; eyes without functional eyelids; toes with enlarged pads ..... 2
- b) Skin tough, with granular or large body scales; eyelids open and close, toes not expanded ..... 5
2. a) Large dorsal tubercles arranged in distinct longitudinal rows on trunk; whorls of spiny scales on the tail ..... 3
- b) No enlarged dorsal tubercles or a few scattered tubercles; lower edge of tail with spiny scales ..... 4
3. a) Numerous large dorsal tubercles arranged in 15 or more longitudinal rows; often with dark spots on back ..... Hemidactylus brookii
- b) Enlarged dorsal tubercles not numerous, arranged in 5-6 rows; no spots on back ..... Hemidactylus frenatus

4. a) Numerous spiny scales forming longitudinal row on lower edge of tail; back often with longitudinal row of light spots; adults to 60 mm snout-vent length ... Hemidactylus garnotii
- b) Widely spaced spiny scales on lower edge of tail; back may have a light stripe along midline; adults greater than 70 mm snout-vent length ..... Hemidactylus flaviviridis
5. a) Granular scales on body and head ..... 6
- b) Plate-like scales on body and head ..... 7
6. a) Short digits, toes of hindfeet slightly longer than sole; nostril nearer to eye than to tip of snout ..... Varanus flavescens
- b) Moderate length digits, toes distinctly longer than sole; nostril nearer to tip of snout than to eye ... Varanus bengalensis
7. a) Scales strongly keeled over entire body; body laterally compressed with long thin tail and limbs; small crest of scales in middle of back ..... Calotes versicolor
- b) Scales smooth or lightly keeled, and shiny; body cylindrical with stout tail and relatively short limbs ..... 8
8. a) Dorsal scales lightly keeled with two or more longitudinal ridges; broad brown stripe on back ..... 9
- b) Dorsal scales smooth ..... Scincella sikimmensis
9. a) Dorsal scales with two keels on each scale; small white

spots on sides of trunk ..... Mabuya dissimilis

- b) Dorsal scales with 5-7 keels on each scale; no white spots, but with narrow black stripes ... Mabuya macularia

#### SNAKES

1. a) Pair of short, erect slightly recurved fangs on maxillary bone followed by 1-3 small teeth; neck can be expanded into hood ..... 2
- b) All maxillary teeth same size or with pair of long fangs with no other teeth; neck cannot be expanded into hood ..... 3
2. a) Light beige or gray to darker brown or olive in body color; back of hood when expanded usually with 1-2 oval-shaped dark markings; head scales not edged in black; one small tooth usually present behind fang; no transverse dark crossbands on back ..... Naja naja
- b) Dark to light brown body; back of hood not marked with oval markings; brown to olive head with scales edged in black except in large adults; transverse dark crossbars on body but may fade with age; three small teeth behind fang ..... Ophiophagus hannah
3. a) Distinctly large, triangular-shaped, thick head with a deep pit between the eye and nostril on each side; pair of long fangs on enlarged maxillary bone; eye with vertical pupils; head and body greenish except for yellow to white lips; ..... Trimeresurus albolabris
- b) Head not wider than neck or only moderately so; no pit on side of head between eye and nostril; numerous maxillary teeth ..... 4

4. a) Body small and worm-like, encased in smooth, shiny, uniform scales, no enlarged ventral scales; no distinction between head and neck; small, black-pigmented spot (eye) without distinct pupil visible under head scales; tail very short ..... Ramphotyphlops braminus
- b) Body not worm-like, enlarged ventral scales (plates) present; round eyes with distinct pupil present and not covered by head scales ..... 5
5. a) Body distinctly marked with crossbands or with a neck collar that may or may not completely encircle the body ..... 6
- b) Body without crossbands, may have stripes, blotches, or spots, or be uniform in coloration, or have an irregular pattern ..... 16
6. a) Scales strongly keeled, rough in appearance; eyes located high up on sides of head directed upwards; snout broad and rounded; posterior teeth enlarged; six chin shields ..... Homalopsis buccata
- b) Scales smooth or with relatively weak keels; eyes not located near top of head but more lateral in position; snout not broad; fewer than 6 chin shields ..... 7
7. a) Black collar on neck bordered by yellow behind on a brown body; two thin black bars on head; small black spots along midline of back and on head; yellow venter with a small black mark on the outer edge of each scale ..... Sibynophis collaris
- b) Series of crossbars along the body which may completely encircle the body, extend over the midback, or occur irregularly along the body; lacks small black spots along

- the back and head; crossbars present in addition to collar ..... 8
8. a) Series of black and yellow bands which completely encircle the body and tail; body in cross-section appears triangular; head not distinct from neck; vertebral scales enlarged (broader than long posteriorly) ..... Bungarus fasciatus
- b) Black or white crossbars of various widths in series dorsally and laterally, but none completely encircling the body; body round or bread-loafed in cross-section; vertebral scales usually nearly equal in size to adjacent scales ..... 9
9. a) Narrow white crossbars or spots on black to dark gray or grayish-brown body ..... 10
- b) Crossbars black ..... 13
10. a) Head not distinct from neck; round pupils ..... 11
- b) Head distinct from neck; vertical pupils ..... 12
11. a) Irregular white crossbars arranged somewhat in pairs, the crossbars are most conspicuous on the posterior half of body; head dark usually with a white spot in front of eye ..... Bungarus caeruleus
- b) Distinct white crossbars forming a complete series along the back; body black; head white with a black bar between the eyes, a black spot on the top of the snout, and a black bar across the back of the head ..... Ophiophagus hannah
12. a) Snout and head broad and flat; a small brownish or

grayish-brown snake with a series of white crossbars; a whitish blotch on each side of the back of the head; body scales not elongated, arranged in straight rows ..... Lycodon aulicus

- b) Head blunt and enlarged; two oblique whitish stripes edged in black from top of head to back of jaw; irregular whitish crossbars on body edged in black on anterior edge; body scales elongated and arranged in oblique rows ..... Boiga trigonata
  
- 13. a) Body colors red, black, and white; white crossbar or crossband on top of head ..... 14
  
- b) Body colors not red, black, and white; no white crossbar or crossband on top of head ..... 15
  
- 14. a) Head slightly elongated; black bands, where present, are narrow and do not completely encircle the body; top of head mostly black with three crossbars of white; large eyes ..... Chrysopela ornata
  
- b) Head blunt, not elongated; red-brown body color with black crossbars (some individuals may have a black stripe along the midback and crossbars restricted to the sides); head black except for a broad white crossband from the anterior edge of the eye to the back of the mouth ..... Calliophis maclellandii
  
- 15. a) Distinct black crossbars on a brown body; black triangle on top of snout in front of the eyes; two arrowhead-shaped black bars on head and neck, the tip of the first on the top of the head and the tip of the second at nape; belly white; pupil round; body scales not oblique; no enlarged vertebral scales ..... Oligodon arnensis

- b) Red, gray or brown snake with the body scales edged in black, forming thin crossbars; enlarged jowls producing a triangular-shaped head; large eyes with vertical pupils; body scales form an oblique pattern; enlarged vertebral scales ..... Boiga ochracea
16. a) Distinct stripes present on all or part of upper body ..... 17
- b) No distinct stripes on upper body; may be uniform (without pattern) or with spots or blotches ..... 23
17. a) A single, light or black middorsal stripe on at least the anterior body ..... 18
- b) Two to five distinct black or brownish stripes on body ..... 19
18. a) Single black middorsal stripe down the back; there may be a series of crossbars restricted to the sides; top of head black with a broad white crossband ... Calliophis macclllandii
- b) Single light middorsal stripe on at least the anterior body ..... 20
19. a) Upper body and head dark brown; venter yellowish, with coloration extending onto sides of body for 1.5 scale rows; yellowish to cream upper lip; body slender; pupil round ..... Dendroelaphis tristis
- b) Body olive brown to black; venter whitish; sides of body spotted in yellowish-white; yellow stripe on top of head starting at the snout passing above the eye to the back of the mouth, this outlines a black spearpoint pattern; lips yellow; pupil vertical ... Elachistodon westermanni

20. a) Two stripes on body, either black or light brown ..... 21  
b) Four to five distinct brown or black stripes on body . 22
21. a) Body form in cross-section shaped like a breadloaf, flat on the bottom; stripes black and located on each side of the midline on the posterior half of the body; anterior body with several dark crossbars containing white spots; body color brownish; black eye-jaw stripe present ..... Elaphe helenae  
b) Body form round in cross-section; stripes light-brown to pinkish starting on the anterior part of the body; background color of olive-brown; a series of dark crossbars or spots is located between the two stripes on the anterior body but fade posteriorly; no eye-jaw stripe; lips yellowish; lip color extending upward in front and behind of the eye ..... Amphiesma stolata
22. a) Four to five brown stripes on body and head; stripes may be edged in black; body round in cross-section ..... Psammophis condanarus  
b) Four black stripes on body only; narrow crossband of black across neck; three black streaks beneath the eye; body shaped like a breadloaf in cross-section, flat on bottom ..... Elaphe radiata
23. a) Upper body uniform in color or posterior half of scales edged in black ..... 24  
b) Body with spots or blotches ..... 25
24. a) Upper and lower body green; snout very elongated forming a point; pupil of eye horizontal; yellow line on edge of ventral scales; spaces between scales on body black and

white forming oblique lines, best seen when the body is inflated ..... Ahaetulla nasuta

b) Upper body brown; snout not elongated; pupil round; uniform pattern or with posterior scales edged in black forming a reticulated pattern, like a braided rope; scales of lips and venter edged in black ..... Ptyas mucosus

25. a) Scales smooth, without keels; heavy bodied with large brownish blotches light in the center and edged in black; body yellowish to grayish; dark streak passing through the eye to the neck; black line below the eye; spear-shaped blotch on top of the head ..... Python molurus
- b) Scales with keels; five rows of black spots on an olive background; one black streak below and one behind the eye; no pattern on top of head ..... Xenochrophis piscator

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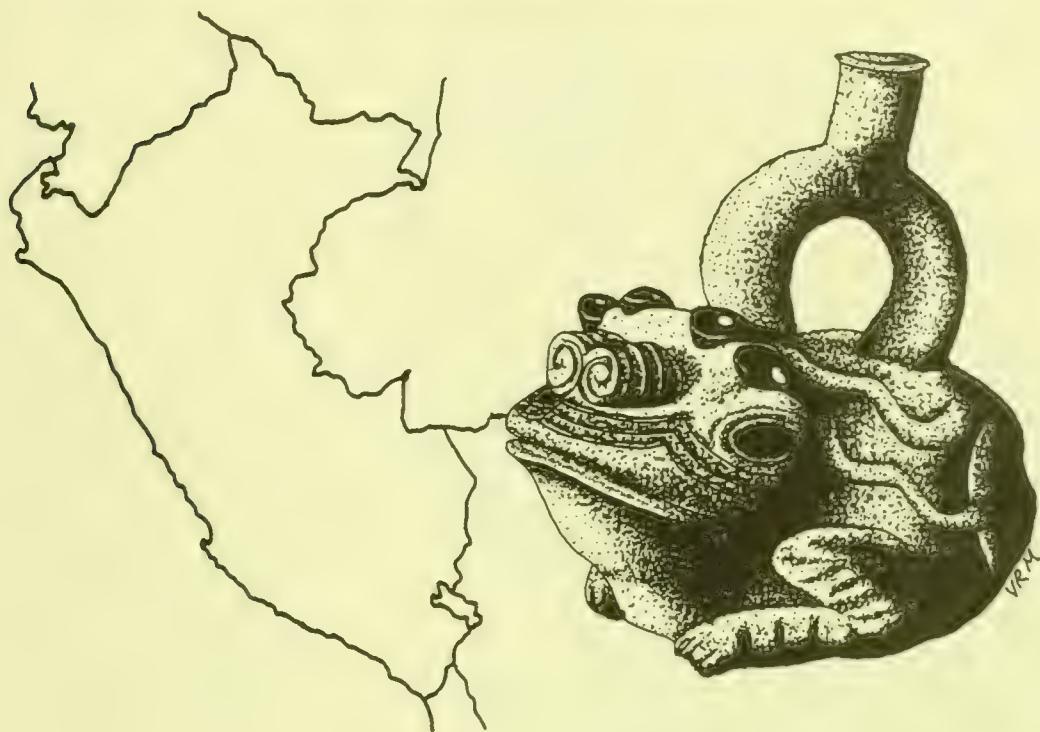






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**CHECKLIST AND TAXONOMIC BIBLIOGRAPHY  
OF THE AMPHIBIANS FROM PERÚ**



Víctor R. Morales  
Asociación de Ecología y Conservación/Perú



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## INTRODUCTION

Until 1985, when Darrel Frost published the Catalogue of the Amphibians Species of de World, no comprehensive list of amphibians of Peru existed. Now, Rodriguez et al. (1993) have published a preliminary list of Amphibians from Perú with species distribution in ecological regions. Herein, I list all the species of amphibians reported from Perú and annotations on some species listed for Rodriguez et al. (op. cit.). The present list contains the following (family/genus/species): in Gymnophiona: 5/6/16, in Caudata: 1/1/3, and in Anura: 9/44/298, the total is 15/51/316. Taxa are listed alphabetically by family, genus, and species.

The bibliography includes only those papers in which the species listed herein were described. A list of all Peruvian herpetofaunal works and a list of Peruvian reptiles will be published by the author in the near future.

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**AMPHIBIA****GYMNOPHIONA****CAECILIIDAE**

- Caecilia attenuata* Taylor, 1968  
*C. corpulenta* Taylor, 1968  
*C. disossea* Taylor, 1968  
*C. gracilis* Shaw, 1802  
*C. inca* Taylor, 1973  
*C. pachynema* Günther, 1859  
*C. tentaculata* Linnaeus, 1758

**OSCAECILIIDAE**

- Oscaecilia bassleri* (Dunn, 1942)  
*Oscaecilia koepckeorum* Wake, 1985 "1984"

**SIPHONOPIDAE**

- Siphonops annulatus* (Mikan, 1820)

**RHINATREMATIDAE**

- Epicrionops bicolor* Boulenger, 1883b  
*E. lativittatus* Taylor, 1968  
*E. peruvianus* (Boulenger, 1902b)  
*E. petersi* Taylor, 1968  
*Nectocaecilia petersii* (Boulenger, 1882b)

**TYPHLONECTIDAE**

- Typhlonectes compressicauda* (Duméril and Bibron, 1841)

**CAUDATA****PLETHODONTIDAE**

- Bolitoglossa altamazonica* (Cope, 1874)  
*B. digitigrada* Wake, Brame, and Thomas, 1982  
*B. peruviana* (Boulenger, 1883c)

**ANURA****BUFONIDAE**

- Atelopus erythropus* Boulenger, 1903  
*A. peruvensis* Gray and Cannatella, 1985

- A. seminiferus Cope, 1874  
 A. spumarius Cope, 1871  
 A. tricolor Boulenger, 1902c  
**Bufo** arborescens Duellman and Schulte, 1992  
 B. arequipensis Vellard, 1959  
 B. cophotis Boulenger, 1900  
 B. corynetes Duellman and Ochoa, 1991  
 B. dapsilis Myers and Carvalho, 1945  
 B. diptychus Cope, 1862b  
 B. fissipes Boulenger, 1903  
 B. flavolineatus Vellard, 1959  
 B. glaberrimus Günther, 1868  
 B. granulosus Spix, 1824  
 B. inca Stejneger, 1913  
 B. iserni (Jiménez de la Espada, 1875)  
 B. leptocelis Boulenger, 1912  
 B. limensis Werner, 1901  
 B. marinus (Linnaeus, 1758)  
 B. nesiotes Duellman and Toft, 1979  
 B. poeppigii Tschudi, 1845  
 B. roqueanus (Melin, 1941)  
 B. simus Schmidt, 1857  
 B. spinulosus Wiegmann, 1834  
 B. trifolium Tschudi, 1845  
 B. typhonius (Linnaeus, 1758)  
 B. variegatus (Günther, 1870)  
 B. vellardi Leviton and Duellman, 1978  
**Dendrophryniscus** minutus (Melin, 1941)

#### CENTROLENIDAE

- Centrolene** buckleyi (Boulenger, 1882a)  
 C. fernandoi Duellman and Schulte, 1993  
 C. hesperium (Cadle and McDiarmid, 1990)  
 C. lemniscatum Duellman and Schulte, 1993  
 C. muelleri Duellman and Schulte, 1993  
**Cochranella** azulae (Flores and McDiarmid, 1989)  
 C. chancas Duellman and Schulte, 1993  
 C. croceopodes Duellman and Schulte, 1993  
 C. euhystrix (Cadle and McDiarmid, 1990)  
 C. mariae (Duellman and Toft, 1979)  
 C. midas (Lynch and Duellman, 1973)  
 C. ocellata (Boulenger, 1918)  
 C. phenax (Cannatella and Duellman, 1982)  
 C. pluvialis (Cannatella and Duellman, 1982)  
 C. saxiscandens Duellman and Schulte, 1993  
 C. siren (Lynch and Duellman, 1973)  
 C. spiculata (Duellman, 1976)  
 C. tangarana Duellman and Schulte, 1993  
 C. truebae (Duellman, 1976)  
**Hyalinobatrachium** bergeri (Cannatella, 1980)  
 H. lemur Duellman and Schulte, 1993

H. munozorum (Lynch and Duellman, 1973)

**DENDROBATIDAE**

- Colostethus argyrogaster Morales y Schulte, 1993  
 C. brunneus (Cope, 1887)  
 C. elachyhystus Edwards, 1971  
 C. idiomelus Rivero, 1991  
 C. littoralis Péfaur, 1985  
 C. marchesianus (Melin, 1941)  
 C. mittermeieri Rivero, 1991  
 C. nexipus Frost, 1986  
 C. peruvianus (Melin, 1941)  
 C. poecilonotus Rivero, 1991  
 C. sylvaticus (Barbour and Noble, 1920)  
 C. trilineatus (Boulenger, 1884 "1883a")  
 Dendrobates biolat Morales, 1992  
 D. captivus Myers, 1982  
 D. fantasticus Boulenger, 1884 "1883a"  
 D. imitator Schulte, 1986  
 D. lamasi Morales, 1992  
 D. mysteriosus Myers, 1982  
 D. reticulatus Boulenger, 1884 "1883a"  
 D. sirensis Aichinger, 1991 T  
 D. vanzolinii Myers, 1982  
 D. variabilis Zimmerman and Zimmerman, 1988  
 D. ventrimaculatus Shreve, 1935  
 Epipedobates azureiventris (Kneller and Henle, 1985)  
 E. bassleri (Melin, 1941)  
 E. bolivianus (Boulenger, 1902c)  
 E. cainarachi Schulte, 1989  
 E. femoralis (Boulenger, 1884 "1883a")  
 E. labialis (Cope, 1874)  
 E. macero Rodríguez and Myers, 1993  
 E. parvulus (Boulenger, 1882a)  
 E. petersi (Silverstone, 1976)  
 E. pictus (Tschudi, 1838)  
 E. silverstonei (Myers and Daly, 1979)  
 E. smaragdinus (Silverstone, 1976)  
 E. tricolor (Boulenger, 1899)  
 E. trivittatus (Spix, 1824)  
 E. zaparo (Silverstone, 1976)

**HYLIDAE**

- Agalychnis craspedopus (Funkhouser, 1957)  
 Gastrotheca abdita Duellman, 1987  
 G. excubitor Duellman and Fritts, 1972  
 G. galeata Trueb and Duellman, 1978  
 G. griswoldi Shreve, 1941  
 G. lateonata Duellman and Trueb, 1988  
 G. longipes (Boulenger, 1882a)



- Phyllomedusa atelopoides* Duellman, Cadle and Cannatella, 1988  
 P. *baltea* Duellman and Toft, 1979  
 P. *bicolor* (Boddaert, 1772)  
 P. *coelestis* (Cope, 1874)  
 P. *duellmani* Cannatella, 1982  
 P. *palliata* Peters, 1872b  
 P. *tarsius* (Cope, 1868)  
 P. *tomopterna* (Cope, 1868)  
 P. *vaillanti* (Boulenger, 1882a)  
*Scarthyla ostinodactyla* Duellman and de Sá, 1988  
*Scinax allenii* (Cope, 1869)  
 S. *chiquitana* (De la Riva, 1990)  
 S. *cruentomma* (Duellman, 1972)  
 S. *funerea* (Cope, 1874)  
 S. *garbei* (Miranda-Ribeiro, 1926)  
 S. *icterica* Duellman and Wiens, 1993  
 S. *oreites* Duellman and Wiens, 1993  
 S. *pedromedinae* (Henle, 1991)  
 S. *rubra* (Laurenti, 1768)  
*Sphaenorhynchus carneus* (Cope, 1868)  
 S. *dorisae* (Goin, 1957)  
 S. *lacteus* (Daudin, 1802)  
*Trachycephalus jordani* (Stejneger and Test, 1891)

#### LEPTODACTYLIDAE

- Adenomera andreae* Müller, 1923  
 A. *hylaedactyla* (Cope, 1868)  
*Batrachophrynum macrostomus* Peters, 1873  
*Ceratophrys cornuta* (Linnaeus, 1758)  
 C. *stolzmanni* Steindachner, 1882  
*Edalorhina nasuta* Boulenger, 1912  
 E. *perezi* Jiménez de la Espada, 1871  
*Eleutherodactylus aaptus* Lynch and Lescure, 1980  
 E. *acuminatus* Shreve, 1935  
 E. *altamazonicus* Barbour and Dunn, 1921  
 E. *bearsei* Duellman, 1992a  
 E. *cajamarcensis* Barbour and Noble, 1920  
 E. *carvalhoi* Lutz, 1952  
 E. *ceuthospilus* Duellman and Wild, 1993  
 E. *citriogaster* Duellman, 1992b  
 E. *colodactylus* Lynch, 1979  
 E. *conspicillatus* (Günther, 1858)  
 E. *cosnipatae* Duellman, 1978b  
 E. *cruralis* (Boulenger, 1902c)  
 E. *cryptomelas* Lynch, 1979  
 E. *danae* Duellman, 1978b  
 E. *diadematus* (Jiménez de la Espada, 1875)  
 E. *eurydactylus* Hedges and Schüler, 1990  
 E. *fenestratus* (Steindachner, 1864)  
 E. *imitatrix* Duellman, 1978c  
 E. *lacrimosus* (Jiménez de la Espada, 1875)

- E. lanthanites Lynch, 1975b  
 E. lindae Duellman, 1978b  
 E. lymani Barbour and Noble, 1920  
 E. lythrodès Lynch and Lescure, 1980  
 E. malkini Lynch, 1980  
 E. martiae Lynch, 1974  
 E. mendax Duellman, 1978c  
 E. nebulosus Henle, 1992  
 E. nigrovittatus Andersson, 1945  
 E. ockendeni (Boulenger, 1912)  
 E. peruvianus (Melin, 1941)  
 E. petrobardus Duellman, 1991a  
 E. phoxocephalus Lynch, 1979  
 E. platydactylus (Boulenger, 1903)  
 E. quaquaversus Lynch, 1974  
 E. rhabdolaemus Duellman, 1978a  
 E. rhodoplichus Duellman and Wild, 1993  
 E. salaputium Duellman, 1978b  
 E. schultei Duellman, 1990a  
 E. scitulus Duellman, 1978a  
 E. sternothylax Duellman and Wild, 1993  
 E. sulcatus (Cope, 1874)  
 E. toftae Duellman, 1978c  
 E. variabilis Lynch, 1968  
 E. ventrimarmoratus (Boulenger, 1912)  
 E. vilarsi (Melin, 1941)  
 E. wiensi Duellman and Wild, 1993  
*Hydrolaetare schimdti* (Cochran and Goin, 1959)  
*Ischnocnema quixensis* (Jiménez de la Espada, 1872)  
*I.* saxatilis Duellman, 1990b  
*Leptodactylus bolivianus* Boulenger, 1898  
 L. diedrus Heyer, 1994  
 L. elenae Heyer, 1978  
 L. fuscus (Schneider, 1799)  
 L. griseigularis (Henle, 1981b)  
 L. knudseni Heyer, 1972  
 L. labrosus Jiménez de la Espada, 1875  
 L. leptodactyloide (Anderson, 1945)  
 L. mystaceus (Spix, 1824)  
 L. pascoensis Heyer, 1994  
 L. pentadactylus (Laurenti, 1768)  
 L. petersii (Steindachner, 1864)  
 L. podicipinus (Cope, 1862a)  
 L. rhodomystax Boulenger, 1884 "1883a"  
 L. rhodonotus (Günther, 1868)  
 L. rhodostima Cope, 1874  
 L. stenodema Jiménez de la Espada, 1875  
 L. ventrimaculatus Boulenger, 1902a  
 L. wagneri (Peters, 1862)  
*Lithodytes lineatus* (Schneider, 1799)  
*Lynchophrys brachydactylus* (Peters, 1873)

- Phrynopus bagrecito Lynch, 1986  
 P. bracki Hedges, 1990  
 P. cophites Lynch, 1975a  
 P. juninensis (Shreve, 1938)  
 P. lucida Cannatella, 1984  
 P. montium (Shreve, 1938)  
 P. nebulanastes Cannatella, 1984  
 P. parkeri Lynch, 1975a  
 P. pereger Lynch, 1975a  
 P. peruanus Peters, 1873  
 P. peruvianus (Noble, 1921)  
 P. simonsii (Boulenger, 1900)  
 P. wettsteini (Parker, 1932)  
 Phyllonastes heyeri Lynch, 1986  
 P. lynchii Duellman, 1991b  
 P. myrmecoides (Lynch, 1976)  
 Physalaemus petersi (Jiménez de la Espada, 1872)  
 P. pustulatus (Shreve, 1941)  
 Pleurodema cinerea Cope, 1877  
 P. marmorata (Duméril and Bibron, 1841)  
 Telmatobius albiventris Parker, 1940  
 T. arequipensis Vellard, 1955  
 T. brevipes Vellard, 1951  
 T. brevirostris Vellard, 1955  
 T. carrillae Morales, 1988  
 T. crawfordi Parker, 1940  
 T. culeus (Garman, 1875)  
 T. ignavus Barbour and Noble, 1920  
 T. intermedius Vellard, 1951  
 T. jelskii (Peters, 1873)  
 T. latirostris Vellard, 1951  
 T. marmoratus (Duméril and Bibron, 1841)  
 T. peruvianus Wiegmann, 1834  
 T. rimac Schmidt, 1954  
 Vanzolinia discodactylus (Boulenger, 1884 "1883a")

#### MICROHYLIDAE

- Chiasmocleis bassleri Dunn, 1949  
 C. ventrimaculata (Andersson, 1945)  
 Ctenophryne geayi Mocquard, 1904  
 Elachistocleis bicolor (Valenciennes, 1838)  
 E. ovalis (Schneider, 1799)  
 Hamptophryne boliviana (Parker, 1927)  
 Syncope antenori Walker, 1973  
 S. carvalhoi Nelson, 1975

#### PIPIDAE

- Pipa pipa (Linnaeus, 1758)  
 P. snethlageae Müller, 1914

**PSEUDIDAE**

*Pseudis paradoxa* (Linnaeus, 1758)

**RANIDAE**

*Rana bwana* Hillis and de Sá, 1988

*R. palmipes* Spix, 1824

**ANNOTATIONS ABOUT LIST OF RODRIGUEZ ET AL. (1993)**

Before the preliminary list of Amphibians from Perú (Rodriguez et al., 1993) was published I did not know of any publication reporting the following species listed below for Peru. In addition Two species were listed in the genus incorrect. Centrolene euhystrix (= Cochranella), Dendrobates labialis (= Epipedobates).

**BUFONIDAE**

*Atelopus bomolochos* Peters, 1973.

*A. pachydermus* (Schmidt, 1857).

*Bufo ceratophrys* Boulenger, 1882.

*B. veraguensis* Schmidt, 1857. Sinonymy of *B. leptoscelis*.

**DENDROBATIDAE**

*Colostethus bocagei* (Jimenez de la Espada, 1971).

**HYLIDAE**

*Hemiphractus proboscidens* (Jimenez de la Espada, 1870).

*Hyla miyatai* Vigle and Goberdham-Vigle, 1990.

*Scinax quinquefasciata* (Fowler, 1913).

**LEPTODACTYLIDAE**

*Eleutherodactylus condor* Lynch, 1979.

*E. croceoinguinis* Lynch, 1968.

*Pseudopaludicola ceratophyes* Rivero y Serna, 1984.

**MICROHYLIDAE**

*Chiasmocleis anatipes* Walker and Duellman, 1974.

**GYMNOPHIONA****TYPHLONECTIDAE**

*Potomotyphlus kaupii* (Berthold, 1859).

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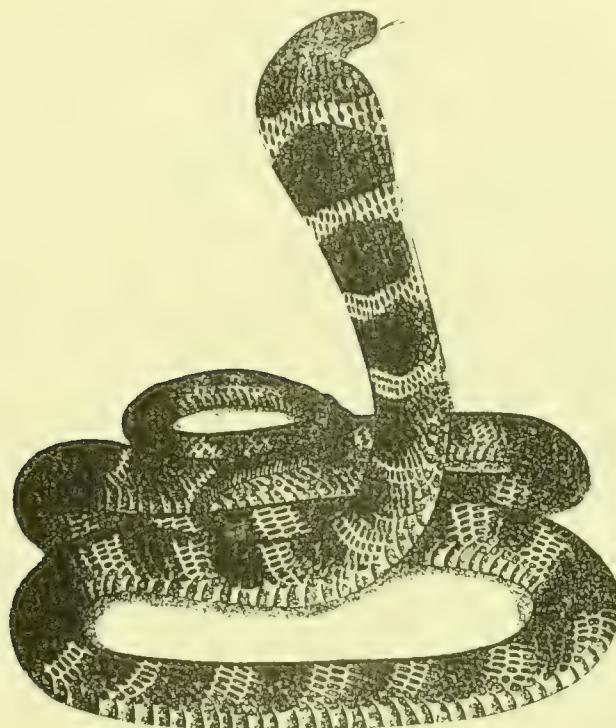
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## BIBLIOGRAPHY OF THE KING COBRA (*OPHIOPHAGUS HANNAH*)



Indraneil Das  
and  
Romulus Whitaker

Centre for Herpetology  
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## INTRODUCTION

Single species bibliographies have been relatively rare, and largely restricted to dramatic species such as carnivorous mammals and large birds that are of conservation importance. Using this argument, a bibliography to the literature on the world's largest venomous snake, the king cobra (*Ophiophagus hannah*) is highly desirable. Not only is this large species becoming increasingly rare as a result of habitat alteration and capture for zoos and even for food, but may be, in many ecosystems, the top predator and its presence thus indicative of environmental health.

While preparing for a study of the autecology of the king cobra, we prepared a bibliography. A total of 397 references were obtained, initially using on-line computer search and finally a manual search of the herpetological library of the Centre for Herpetology, Madras, the Sarawak Museum, Kuching, the Bombay Natural History Society, Bombay and the Musée National d'Histoire Naturelle, Paris, and from the authors' personal libraries and that of Anslem De Silva of the Faculty of Medicine, University of Peradeniya. The search concluded May 7, 1995.

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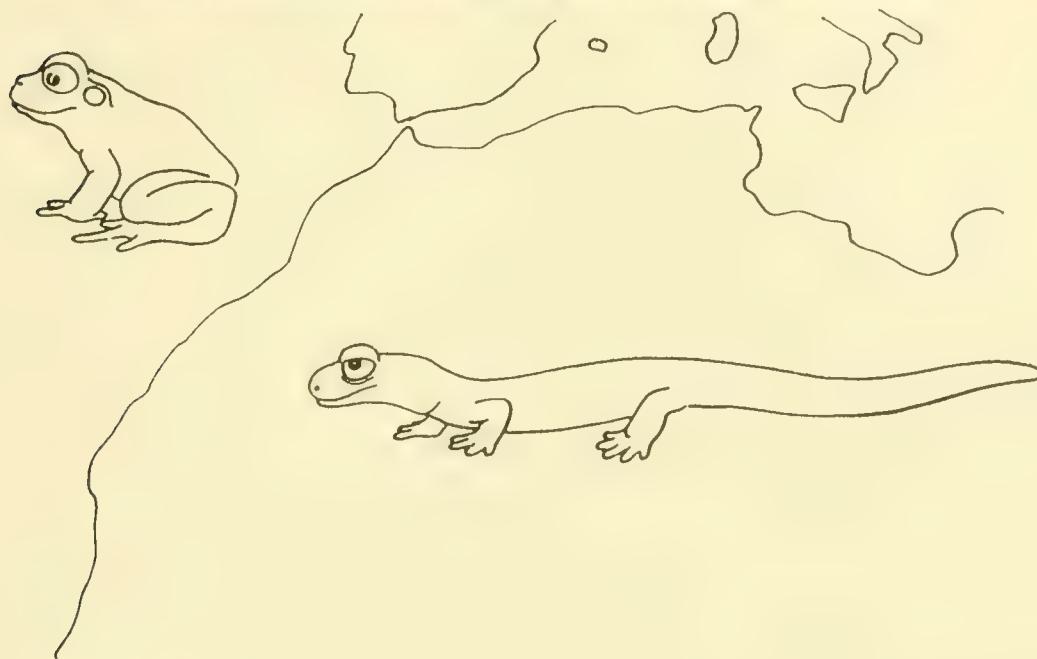
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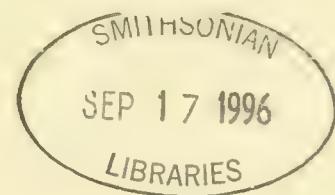


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## AMPHIBIANS OF NORTHWEST AFRICA



Alfredo Salvador  
Departamento de Ecología Evolutiva  
Museo Nacional de Ciencias Naturales



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## INTRODUCTION

This paper provide a checklist, illustrated keys, range maps and summarized information on the biology and ecology of the amphibians of northwest Africa. The geographic area covered includes Morocco (including Western Sahara), Algeria, Tunisia, and Libya. The regions of Mauritania, Mali, Niger, and Tchad located north of 20° longitude are included. Saharan mountains, specially the Tibesti, are probably the least known regions in the area. Pellegrin (1936) and Scortecci (1940) mention the presence of *Bufo* sp. and *Rana* sp. in the Tibesti massif. I could not locate specimens of amphibians from these mountains in museum collections. Major works of the amphibians of the region are those of Pasteur and Bons (1959) on Morocco, Doumergue (1901) on Algeria and Scortecci (1936) on Tripolitania (Libya). Information on newts is found in Thorn (1968). For a more comprehensive bibliography of the area see Busack (1976). Information on the amphibians of Egypt is found in Marx (1968).

To prepare distribution maps I examined specimens of the following institutions: American Museum of Natural History, New York (AMNH); British Museum (Natural History), London (BMNH); California Academy of Sciences, San Francisco (CAS); Carnegie Museum of Natural History, Pittsburgh (CM); Field Museum of Natural History, Chicago (FMNH); Los Angeles County Museum of Natural History, Los Angeles (LACM); Museo Civico di Storia Naturale, Genoa (MSNG); Museum d'Histoire Naturelle, Geneve (MHNG); Museum of Comparative Zoology, Harvard (MCZ); Museum of Vertebrate Zoology, Berkeley (MVZ); Museo Zoologico della Specola, Firenze (MZUF); National Museum of Natural History, Washington DC (USNM); Naturhistorisches Museum, Basel (NHMB); Naturhistorisches Museum, Wien (NMW); Naturhistoriska Museet, Goteborg (NHMG); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); Senckenberg Museum, Frankfurt (SMF); Swedish Museum of Natural History, Stockholm (NHRM); University of Michigan Museum of Zoology, Ann Arbor (UMMZ); Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK); Zoologisches Staatsammlung, München (ZSM).

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### Order Caudata

Also called Urodela, so titled because they have long tail, long body and distinct body regions. The front limbs are similar in size to the hind ones. They lack external ear openings. Both adults and their larvae are carnivorous. Fertilization is internal but there is no copulation. Males deposit a gelatinous capsule - the spermatophore - which contain the spermatozoa. The female places this capsule in her cloaca. This generally takes place in water. The larvae have external gills.

Of the approximately 392 species alive today, only three are found in Africa and their distribution is limited to the extreme northwest. The three species belong to the family Salamandridae.

#### Family Salamandridae

Some 55 species currently live in Europe, Asia, North Africa, and North America. Generally nocturnal with cryptic habits. *Salamandra salamandra* is terrestrial and lives in wooded areas with relatively high humidity. This species does not lay eggs and give birth to well-developed larvae. It is found in Europe and Southwest Asia as well as North Africa.

The two species of *Pleurodeles* are terrestrial with the exception of the reproductive season, which is spent in water. One of the species - *P. poireti* - is endemic to the north of Algeria and Tunisia, while the other - *P. waltl* - is also found in the Iberian Peninsula.

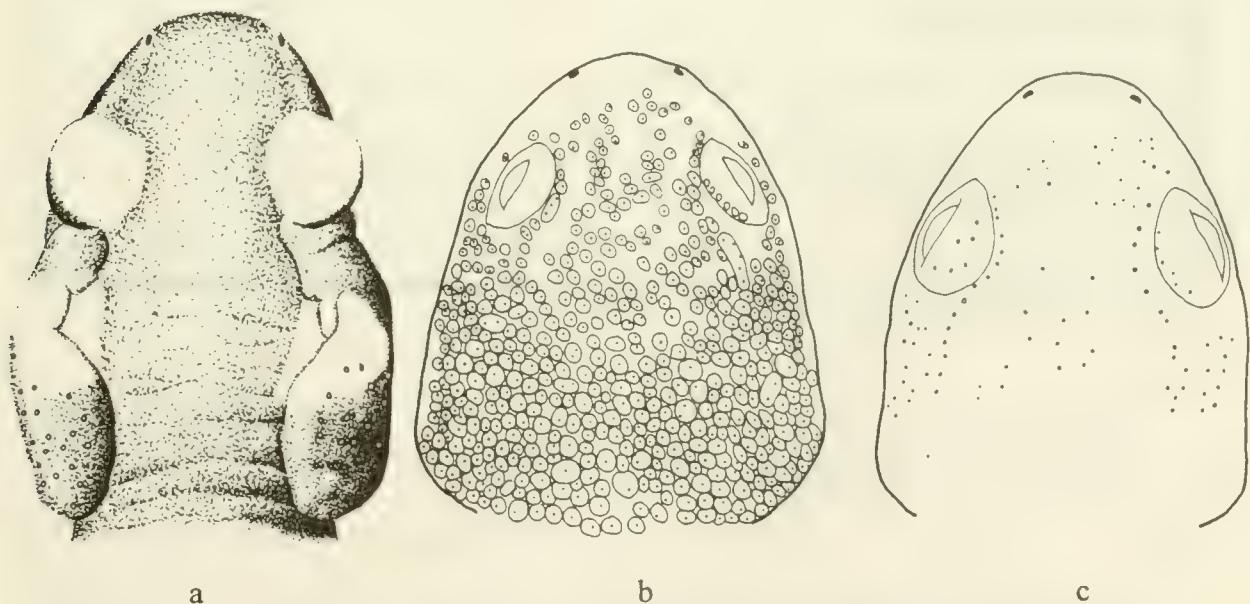


Fig. 1. Dorsal view of the head of *Salamandra salamandra* (a), *Pleurodeles waltl* (b), and *Pleurodeles poireti* (c).

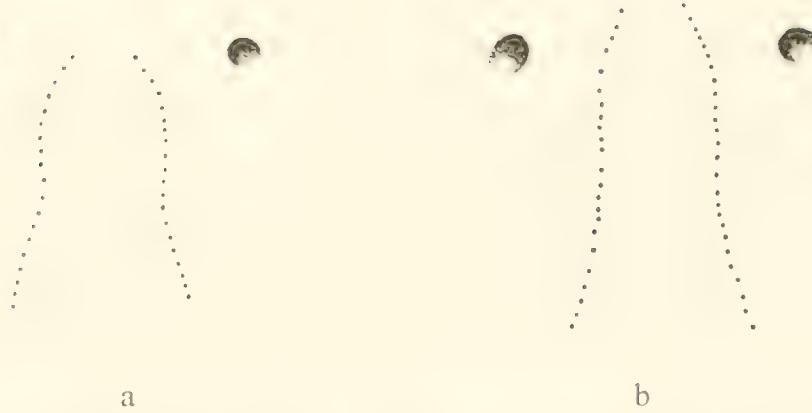


Fig. 2. Position of palatal teeth and choanae in *Pleurodeles poireti* (a) and *Pleurodeles waltl* (b).

#### Key to the salamanders

1. Smooth skin. With paratoid glands on the back of the head (Fig. 1a). Tail round ..... ***Salamandra salamandra***
- . Rough skin. With no paratoid glands (Figs. 1b, 1c). Tail laterally compressed..... 2
2. The palatal teeth extend anterior of the choanae (Fig. 2b). Large size. Conspicuous gular fold. A row of 8 to 10 distinct, ochre or white warts on each side..... ***Pleurodeles waltl***
- . The palatal teeth do not extend beyond the choanae (Fig. 2a). Small size. Not very conspicuous gular fold. With no warts on the sides..... ***Pleurodeles poireti***

***Pleurodeles poireti*** (Gervais, 1835) (Figs. 1c, 2a, 3)

*Triton poireti* Gervais, 1835. Bull. Soc. Sci. Nat. France, 6: 113.

*Molge poireti*: Boulenger, 1891:162. Doumergue, 1901:381.

*Glossoliga hagenmuelleri* Lataste, 1881. Le Naturaliste, 1881:371.

*Molge hagenmulleri*: Boulenger, 1891:162. Doumergue, 1901: 385.

*Pleurodeles poireti hagenmulleri*: Wolterstorff, 1905:263.

*Pleurodeles poireti*: Pasteur, 1958:161.

#### Diagnosis

Small-bodied species. No yellowish or orange-coloured warts on its sides. Front of vomeropalatine tooth rows not at or behind level of choanae.

#### Size

Total lengths to 176 mm.

#### Description

Head not flattened, as long as it is wide. Body round in cross-section, somewhat depressed middorsally. Conspicuous

gular fold. Has no prominent warts on the sides. Tail laterally compressed, as long or longer than the head and body. No tail crests. Warty skin except on the abdomen. Males with poorly developed black keratinous pads on inner side of forelimbs when breeding.

#### Variation

Variations between populations of Algeria and Tunisia have been described which would affect size, tail proportions, gular fold, jaw curvature and toe shape. This variation seems to be of an individual type and subspecies *hagenmuelleri* Lataste, 1881 is not recognized presently.

#### Ecology

Unknown.

#### Biology

The only available data were observed in captivity. Copulation is similar to that of *P. waltl*.

#### Distribution

Northern Algeria and Tunisia (Fig. 3).

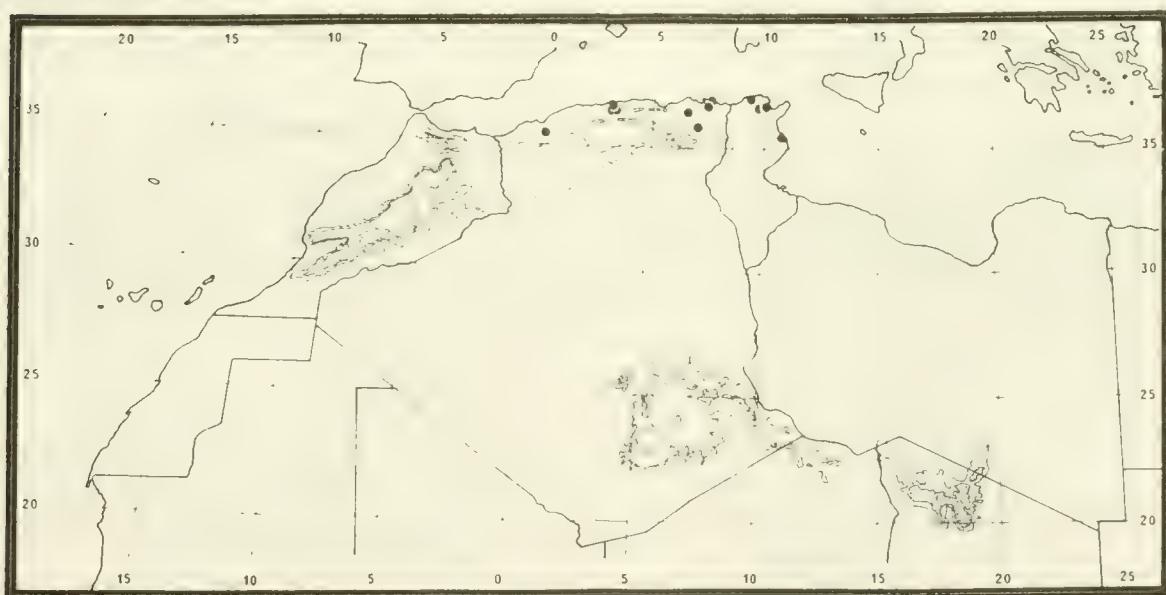


Fig. 3. Distribution of *Pleurodeles poireti*.

#### Bibliography

Pasteur (1958), Thorn (1968), Wolterstorff (1905).

***Pleurodeles waltl*** Michahelles, 1830

(Figs. 1b, 2b, 4)

*Pleurodeles waltl* Michahelles, 1830. Isis von Oken, 23: 195.  
*Pleurodeles waltlii* Boettger, 1874.

*Molge waltlii*: Boulenger, 1891:162. Doumergue, 1901:389.

*Pleurodeles waltli*: Pasteur and Bons, 1959:80. Thorn, 1968: 124.

### Diagnosis

Large bodied, with wide, depressed head. Head, body, tail and extremities covered with small tubercles. Eight or 10 ochre or whitish warty protuberances on each side. Tail strongly compressed laterally with reduced crests. Front of vomeropalatine tooth rows beyond level of choanae.

### Size

Total lengths to 252 mm in males and 242 mm in females.

### Description

Strongly depressed head, slightly longer than wide; Round snout; small, dorsolateral eyes. Conspicuous gular fold. Body, except abdomen, covered with tubercles. Tail laterally compressed; its length approximately equal snout-vent length. Tail tip blunt. Dorsal and ventral crests on tail, somewhat more prominent in males during reproductive period. Males have black keratinous pads on the inner side of the forelimbs when breeding. Each side of body with a series of ochre or whitish protuberances. During breeding season, crests turns orange. Cloacal opening similar in both sexes; papillate appearance in males and ridged in females. Coloration olive green, brownish or yellowish grey. Venter yellowish or orange-coloured with scattered dark marks.

### Variation

Adults from Morocco are smaller than those from the Iberian Peninsula. Also when breeding, crest development is less and of shorter duration than in the Iberian ones. The tail is shorter than or the same as snout-vent length in metamorphic individuals and longer in adults. Individual or geographic variation in Morocco has not been described.

### Ecology

This species live from sea level to 1100 m. Its basic diet is crustaceans. It spend the summer under stones and in fissures in the mud at depths of 30-50 cm and is aquatic during the reproductive season. Between December and January, young specimens are observed under stones or in the mud. They have been found in caves at depths of 60-70 m.

### Biology

They breed in temporary ponds and slow moving waters. Active adults can be observed on rainy nights. Larvae are observed from the end of February onwards. Larvae reach a total length of 115 mm. Metamorphs collected on May measured from 31 to 60 mm SVL. Metamorphs are found from May until the end of October. Larvae are larger at the end of the season. Reproductive individuals measure a minimum total length of 97 mm.

### Distribution

Western Morocco (Fig. 4).

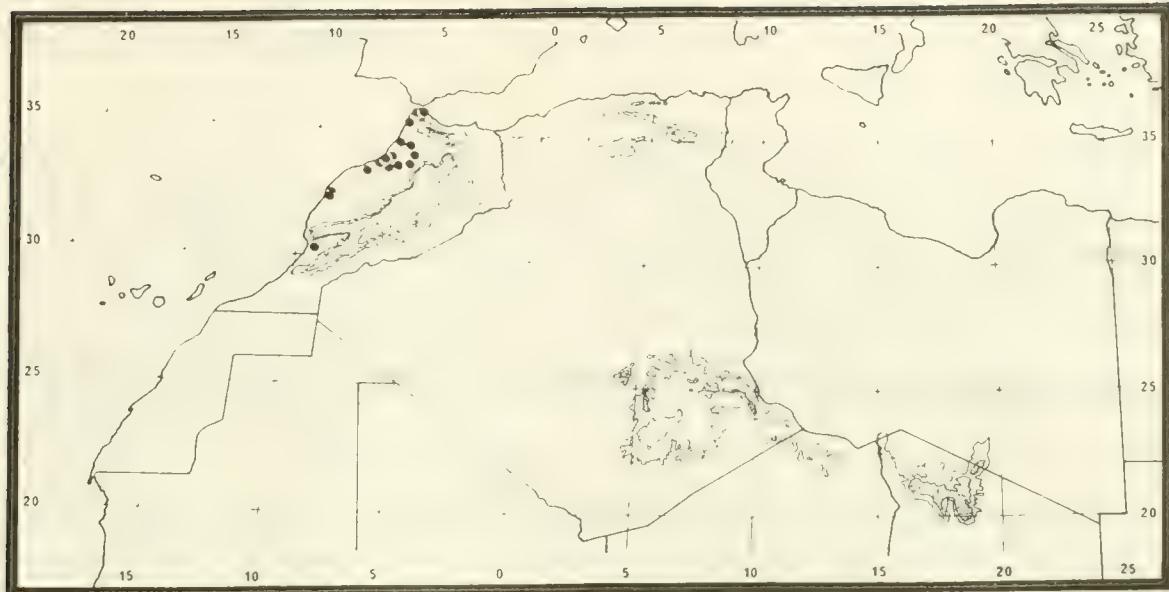


Fig. 4. Distribution of *Pleurodeles waltl.*

#### Bibliography

Dorda (1984), Pasteur (1958), Pasteur and Bons (1959),  
Thorn (1968).

**Salamandra salamandra algira** Bedriaga, 1883 (Fig. 1a, 5)

*Salamandra maculosa*: Boulenger, 1891:161. Doumergue, 1901:370.  
*Salamandra maculosa* var. *algira* Bedriaga, 1883. Arch. Naturg.,  
49:252. Pasteur and Bons, 1959: 93. Thorn, 1968:161.  
*Salamandra salamandra algira*: Eiselt, 1958:133.

#### Diagnosis

Black with yellow spots. Kidney-shaped paratoids on the upper part of the head. Smooth skin with no tubercles.

#### Size

Total lengths to 226 mm.

#### Description

Narrow, somewhat depressed head with rounded snout and conspicuous paratoids. Gular fold present. Subcylindric tail, somewhat laterally compressed. Smooth dorsum with parasagittal and lateral row of pores on each side. Cloacal opening similar in both sexes, lips somewhat larger in males. Background color blackish with yellow spots variable in form and arrangement.

#### Variation

The North African populations are characterized by their relatively small size, and a long and narrow tail, and a short, narrow, flattened head with short, narrow paratoids. Pattern varies from two rows of rather long marks on the dorsum to a single row of circular marks or to scattered, isolated spots.

The venter is black, sometimes with yellow spots. The subspecies *algira* Bedriaga, 1883 is applied to these populations.

#### Ecology

It occurs to 2010 m in Morocco, 1550 m in Algeria, and 1500 m in Tunisia. In Algeria it lives in *Cedrus* and *Quercus* woods. During the day it is found under stones and among roots. It lives near streams. It has been observed in caves. Groups of 15 to 20 active salamanders have been seen in November in Algeria.

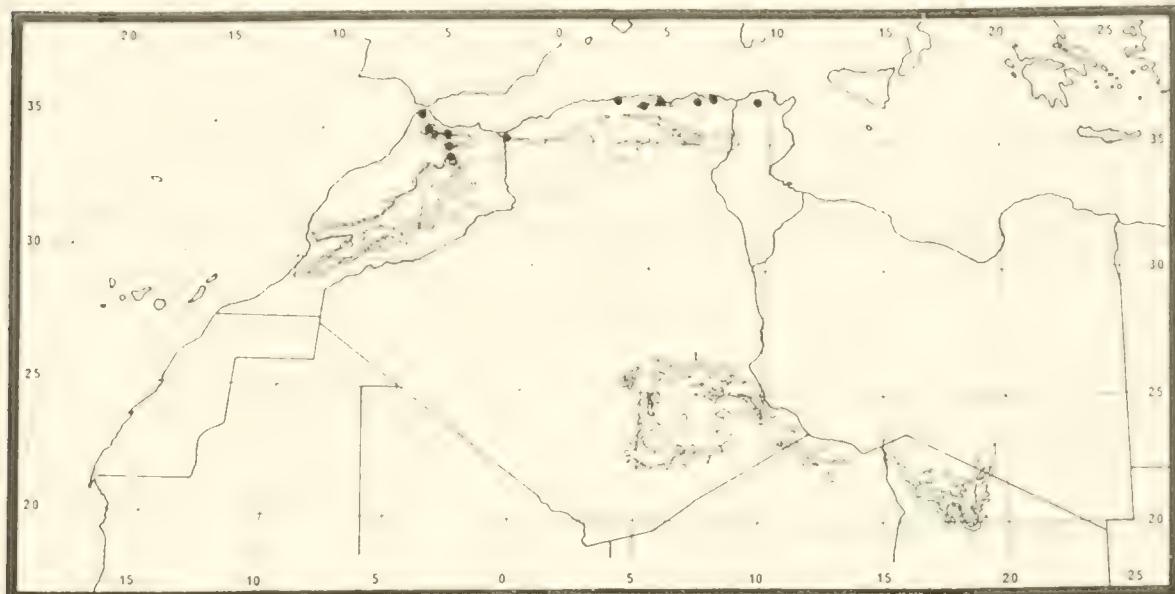


Fig. 5. Distribution of *Salamandra salamandra*.

#### Biology

Birth of 16 larvae were reported in May in Algeria. A female caught in December in Morocco had 15 larvae of 27 mm in total length. Towards the end of February larvae in the water in the Rif mountains, and recently metamorphosed individuals under stones were observed.

#### Distribution

Northern Morocco, northern Algeria, and northern Tunisia (Fig. 5).

#### Bibliography

Bons (1972), Boulenger (1891), Dorda (1984), Doumergue (1901), Eiselt (1958), Galán (1931), Geniez and Soto (1994), Pasteur and Bons (1959), Thorn (1968).

#### Order Anura

There are approximately 3967 species of frogs and toads. Their body is short and without tail. Hindlimbs are larger than forelimbs. Many anurans have a conspicuous tympanum and use vocalizations to attract mates.

Anurans are represented in northwestern Africa by five families and 13 species.

Key to Anurans

1. With adhesive circular pads on tips of fingers and toes (Fig. 13) ..... ***Hyla meridionalis***
- . Lacking adhesive pads on tips of fingers and toes..... 2
2. Pupil vertical..... 3
- . Pupil not vertical..... 4
3. Black keratinous spade (modified metatarsal tubercle) present. Two relatively small and inconspicuous palmar tubercles. Toes with webbing (Fig. 11)..... ***Pelobates varaldii***
- . Lacking metatarsal spade. Three palmar tubercles. Toes without webbing (Fig. 7)..... ***Alytes obstetricans***
4. Skin more or less smooth. No paratoid glands ..... 5
- . Skin with warts. Conspicuous paratoid glands..... 8
5. Pupil rounded. Subarticular tubercles lacking (Fig. 9)..... ***Discoglossus pictus***
- . Pupil horizontal. Subarticular tubercles present..... 6
6. With dorsolateral glandular ridge on body..... ***Rana saharica***
- . Without dorsolateral glandular ridge on body..... 7
7. Large inner metatarsal tubercle, larger than toe next to it (Fig. 31). Tympanum indistinct, its diameter half that of the eye. Webbing of the toes slight (Fig. 31) .. ***Tomopterna cryptotis***
- . Small inner metatarsal tubercle, much smaller than toe next to it (Fig. 29). Tympanum conspicuous, diameter nearly equal to that of eye. Webbing of toes extensive (Fig. 29) .. ***Hoplobatrachus occipitalis***
8. With tarsal spade. Large inner and outer metatarsal tubercles, spade-shaped (Fig. 25) ..... ***Bufo pentoni***
- . Without tarsal spade. Metatarsal tubercles not spade-shape..... 9
9. Without tarsal fold. Dorsal colour uniformly brown. ***Bufo bufo***
- . Tarsal fold present. With spots on dorsum..... 10

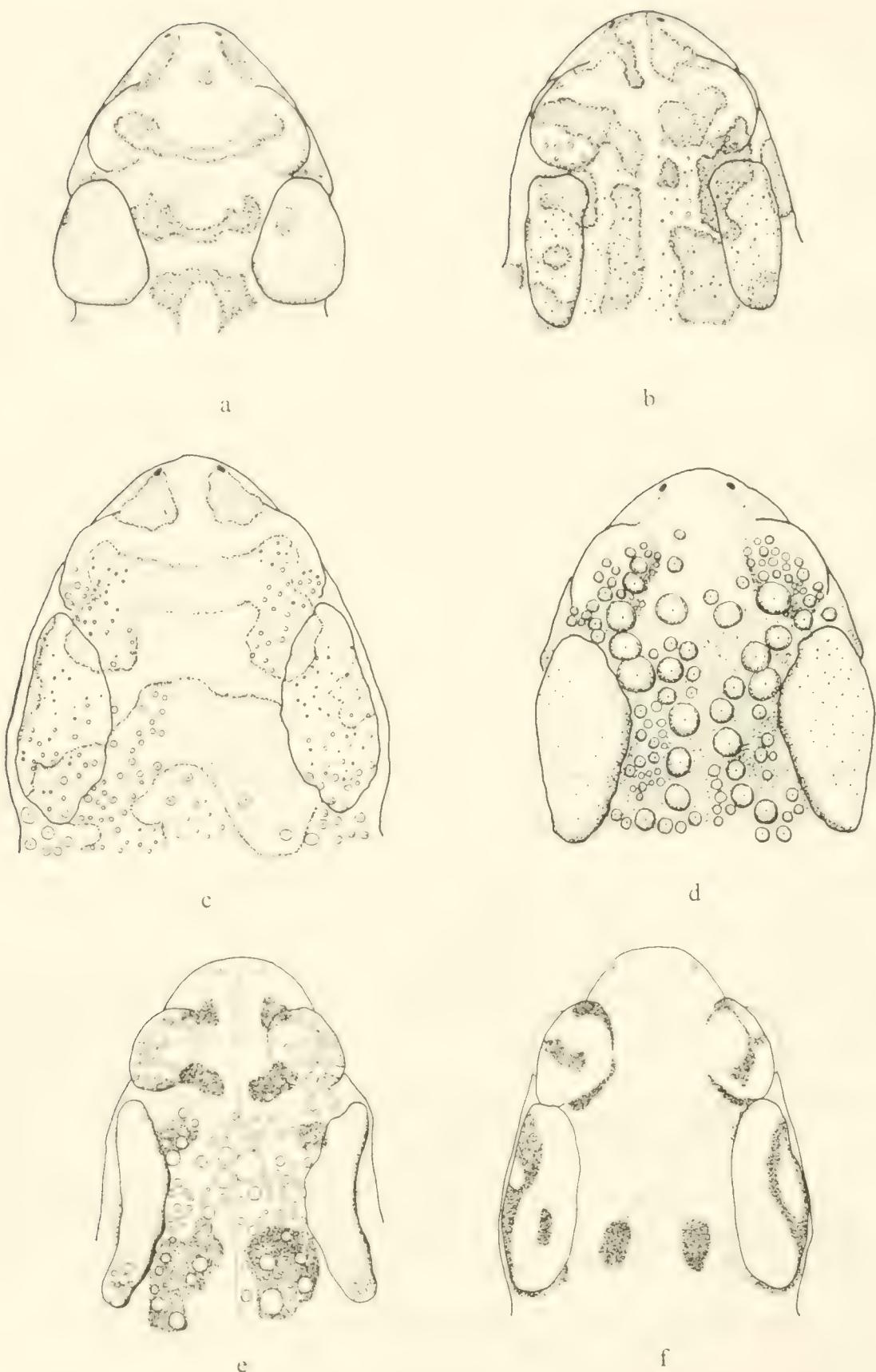


Fig. 6. Dorsal view of head of *Bufo brongersmai* (a), *Bufo viridis* (b), *Bufo mauritanicus* (c), *Bufo bufo* (d), *Bufo xeros* (e), and *Bufo pentoni* (f).

10. With green spots on the dorsum.....11  
 -. With brown spots on the dorsum.....12
11. Paratoid glands elongated (Fig. 6b). Distal subarticular tubercle of fourth toe single (Fig. 21).....**Bufo viridis**
- . Paratoid glands rounded (Fig. 6a). Distal subarticular tubercle of fourth toe double.....**Bufo bronigersmai**
12. Distal subarticular tubercle of fourth toe double (Fig. 19). Numerous irregular spots on dorsum.....**Bufo mauritanicus**
- . Distal subarticular tubercle of fourth toe single (Fig. 23). Six pairs of roughly square-shaped spots on head and dorsum.....**Bufo xeros**

#### Family Discoglossidae

This family includes some sixteen species found in Europe, Asia, and North Africa. The majority are terrestrial. In general they deposit their eggs in the water except in the genus *Alytes*. The species of *Alytes* exhibit parental care. Amplexus takes place on the ground, and the female transfers the eggs to the male who sticks them to his hindlimbs. He carries them for a period of time, then takes them to water for the larvae to hatch.

Two species live in North Africa. *Discoglossus pictus* also occurs on the island of Sicily, and *Alytes obstetricans* occurs in SW Europe.

#### ***Alytes obstetricans*** Laurenti, 1768

(Figs. 7-8)

*Alytes obstetricans*: Galán, 1931:362.

*Alytes (obstetricans) maurus* Pasteur and Bons, 1962. Bull. Soc. Zool. France, 87 (1):71.

#### Diagnosis

Small toad. Pupil vertical. Paratoid glands small and not kidney-shaped. Lacking interdigital membranes and subarticular tubercles. Three palmar tubercles present. Skin with small warts.

#### Size

Snout-vent lengths to 39 mm.

#### Description

Wide, somewhat flattened head, with a round snout that is somewhat pointed at its tip. Circular tympanum with a diameter 0.67- 0.79 times horizontal diameter of eye. Long, slender digits. First digit of the hand shorter than second, second and fourth digits subequal and shorter than third. Three palmar

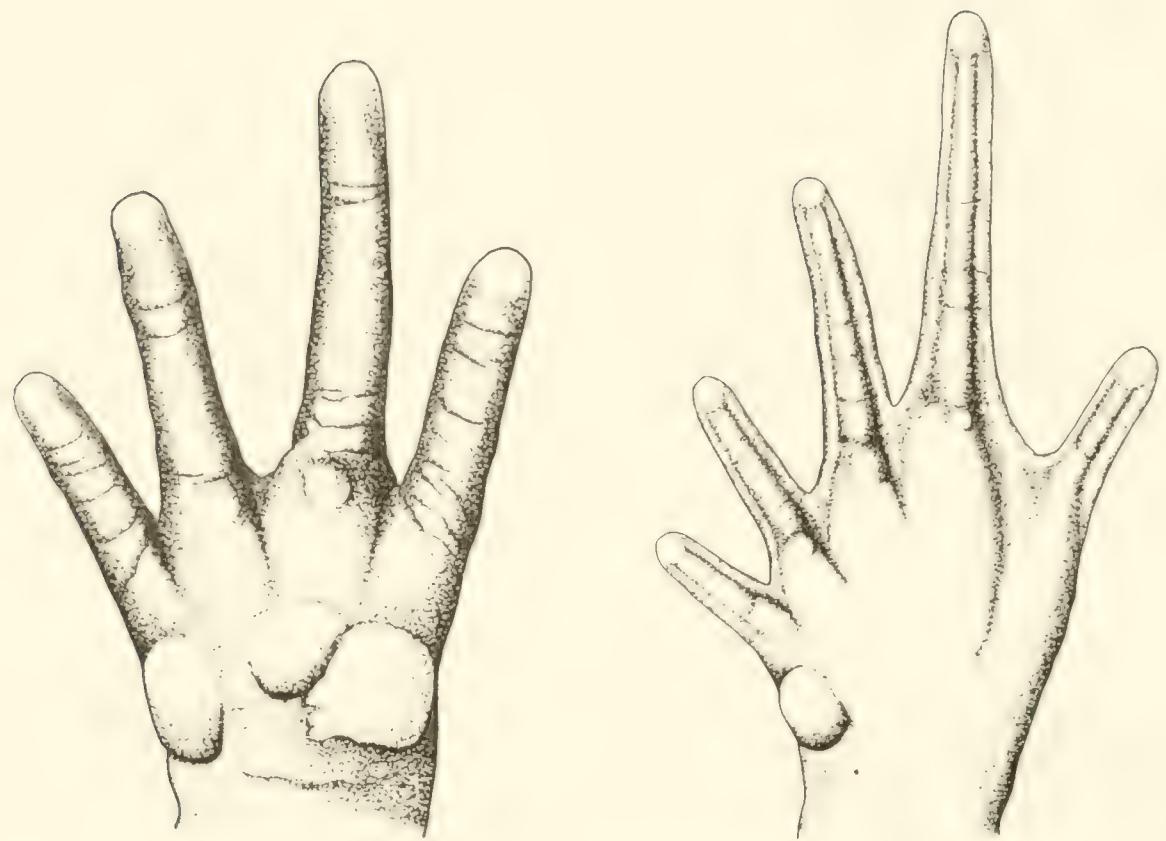


Fig. 7. Palmar view of hand (left) and plantar view of feet (right) of *Alytes obstetricans* (USNM 196383).

tubercles; small inconspicuous tubercle at the base of each digit. Hindlimbs short with long toes, lacking subarticular

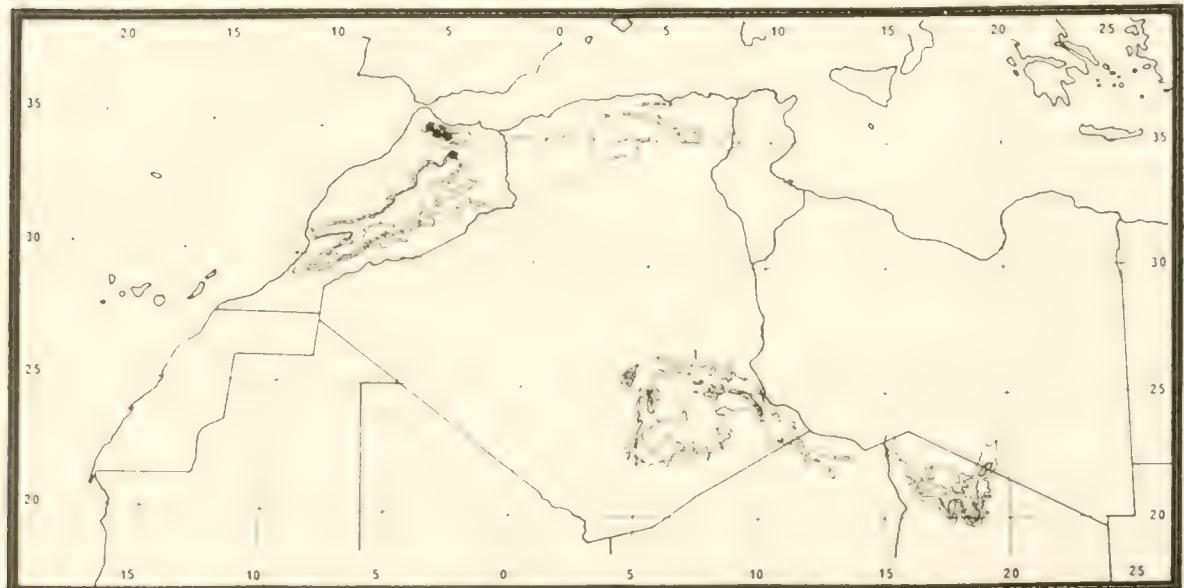


Fig. 8. Distribution of *Alytes obstetricans*.

tubercles. Inner metatarsal tubercle present. Dorsum and flanks covered with small warts. Paratoid gland above the tympanum, extending posterior as a series of small glands on each side of the body. Skin of the belly granulated. Dorsal colour greyish brown with small green patches on the head, back, and upperparts of the limbs. Venter whitish. Iris golden.

#### Variation

*Alytes obstetricans* is smaller in Morocco than Europe; also the body is slender, and the digits longer and thinner. No individual or geographical variation within Morocco has been described.

#### Ecology

Its ecology is little known in North Africa, but it has been found between 850 and 1500 m altitude.

#### Biology

Tadpoles have been reported in March and August and recently metamorphosed individuals in October.

#### Distribution

Rif and nearby Middle Atlas mountains, Morocco (Fig. 8).

#### Bibliography

Arntzen and Szymura (1984), Galán (1931), Libis (1985), Mellado and Mateo (1992), Pasteur (1961), Pasteur and Bons (1959, 1962).

### ***Discoglossus pictus scovazzii* Camerano, 1878 (Figs. 9-10)**

*Discoglossus pictus*: Boulenger, 1891:160. Pasteur and Bons, 1959: 100.

*Discoglossus scovazzii* Camerano, 1878. Att Acc. Torino, 13: 548.

*Discoglossus auritus* Heron-Royer, 1889. Bull. Soc. Angers, 1889:177.

*Discoglossus pictus scovazzi*: Capula et al., 1985:71.

#### Diagnosis

Frog-like, with pointed snout and round pupil. No subarticular tubercles. Tympanum inconspicuous. Dorsum with dorsolateral fold on each side, usually extending only from eye to shoulder. Back with irregular dark spots or longitudinal stripes.

#### Size

Snout-vent lengths to 70 mm in males and 68 mm in females.

#### Description

Head strongly depressed, with pointed or round snout. Fingers short, first shortest and third longest; second and fourth of equal length. Three palmar tubercles and no subarticular tubercles. Hindlimbs relatively long, with slight

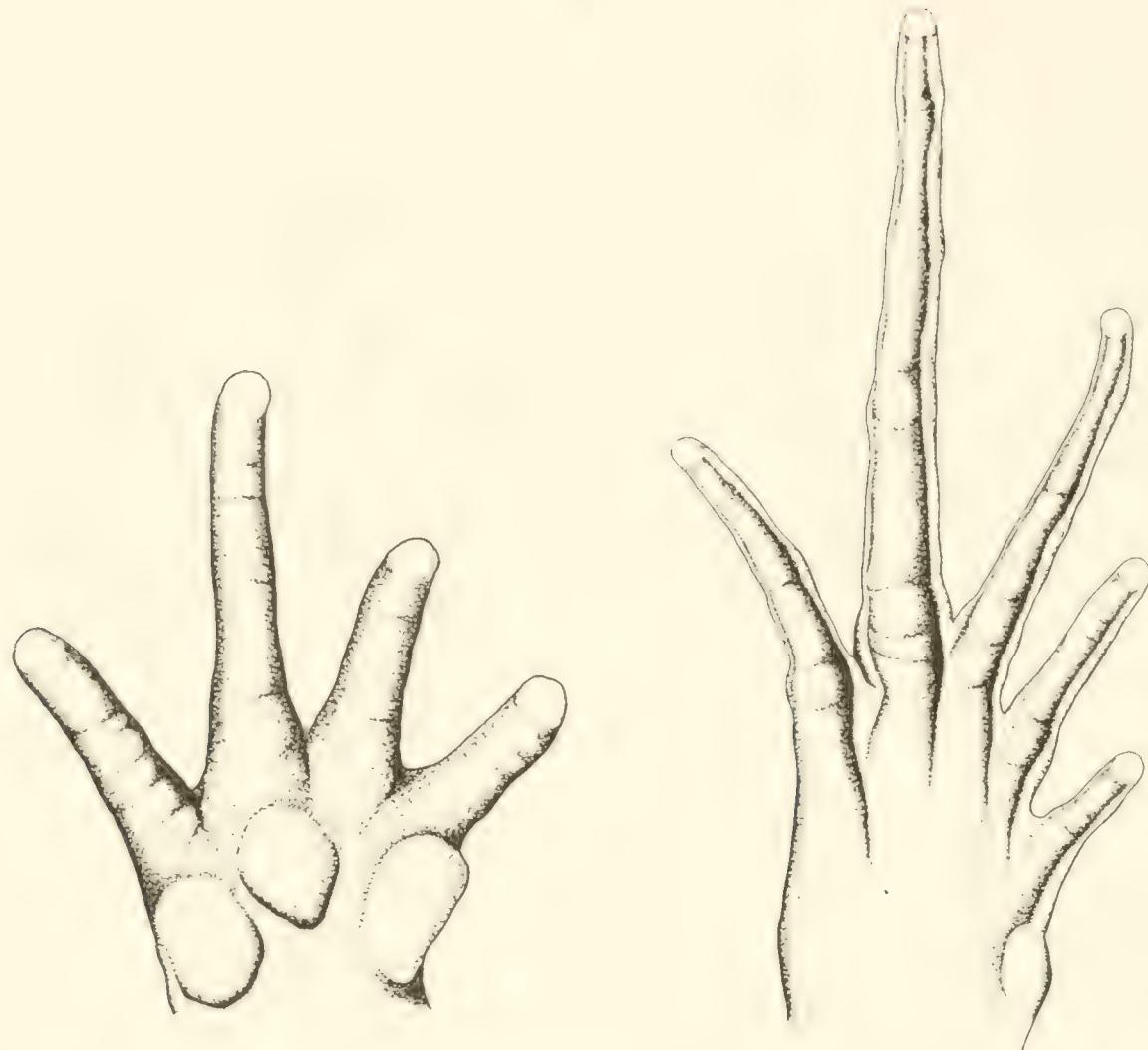


Fig. 9. Palmar view of hand (left) and plantar view of feet (right) of *Discoglossus pictus* (MVZ 186138).

webbing between toes. Small inner metatarsal tubercle present. Vomerine teeth in straight or slightly curved series, narrowly separated medially. Tongue disc-shaped. Skin smooth with small glands on dorsum.

Dorsal colour brownish, olivaceous, or grey. Dark temporal band from snout to tympanum. On back, dark spots of irregular shape and size, occasionally forming longitudinal stripes. Iris golden or bronze coloured. Venter whitish or yellowish, sometimes olivaceous red. Males with blackish corneous excrescences on the throat, belly, and limbs.

#### Variation

The North African populations are considered conspecific with those from Sicily, although they are sufficiently differentiated to be included in the subspecies *scovazzii* Camerano 1878. There is local variation in the proportion of individuals with spots or stripes.

#### Ecology

*Discoglossus pictus* occurs from 20 to 2650 m in Morocco and reaches 1000 m in Algeria. In Morocco it lives beside fresh

or saline water and in Algeria in small streams and canals with grass. In Morocco, it is found in areas with permanent water, cisterns, ruins, in *Quercus* forest and *Nerium oleander* scrub. It is active from September through the winter, commonest from February to April. Spends the summer hidden in crevices or under rocks. Its predators include *Natrix maura*, and cannibalism has been reported.

### Biology

The males are the first to gather at water. Pairing is at night. In Algeria, egg-laying takes place from early February until late June. The tadpoles reach lengths to 41 mm. At the time of metamorphosis, they measure 10 mm. In Morocco at the end of February, small tadpoles and newly metamorphosed individuals are observed at the same time. The young reach a size of 36 mm in September.

### Distribution

Morocco, northern Algeria and Tunisia including Galita Islands (Fig. 10).

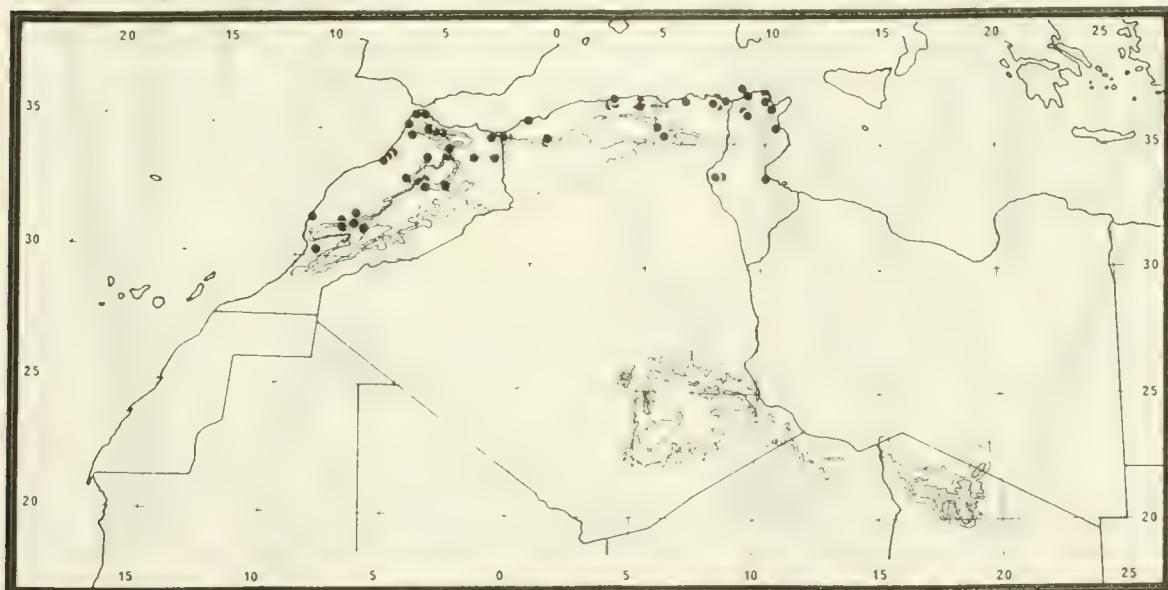


Fig. 10. Distribution of *Discoglossus pictus*.

### Bibliography

Busack (1986), Camerano (1878), Capula et al. (1985), Deyrolle (1905), Doumergue (1901), Dubois (1982), Gallien (1948), Heron-Royer (1888, 1891), Lanza et al. (1984), Maxson and Szymura (1984), Malkmus (1981), Pasteur and Bons (1959), Stemmler (1972), Stemmler and Hotz (1972).

### Family Pelobatidae

Pelobatid frogs comprise some 90 living species that are found in North America, Europe, Asia, and North Africa. Their pupils are vertical. They are generally burrowers, using their

spade shaped metatarsal tubercles for digging. Usually they lay their eggs in temporary ponds. The species *Pelobates varaldii* lives in North Africa and is endemic to northwestern Morocco.

***Pelobates varaldii*** Pasteur and Bons, 1959

(Figs. 11-12)

*Pelobates varaldii* Pasteur and Bons, 1959. Trav. Inst. Scient. Maroc. Biol., Ser. Zool., 11: 111.

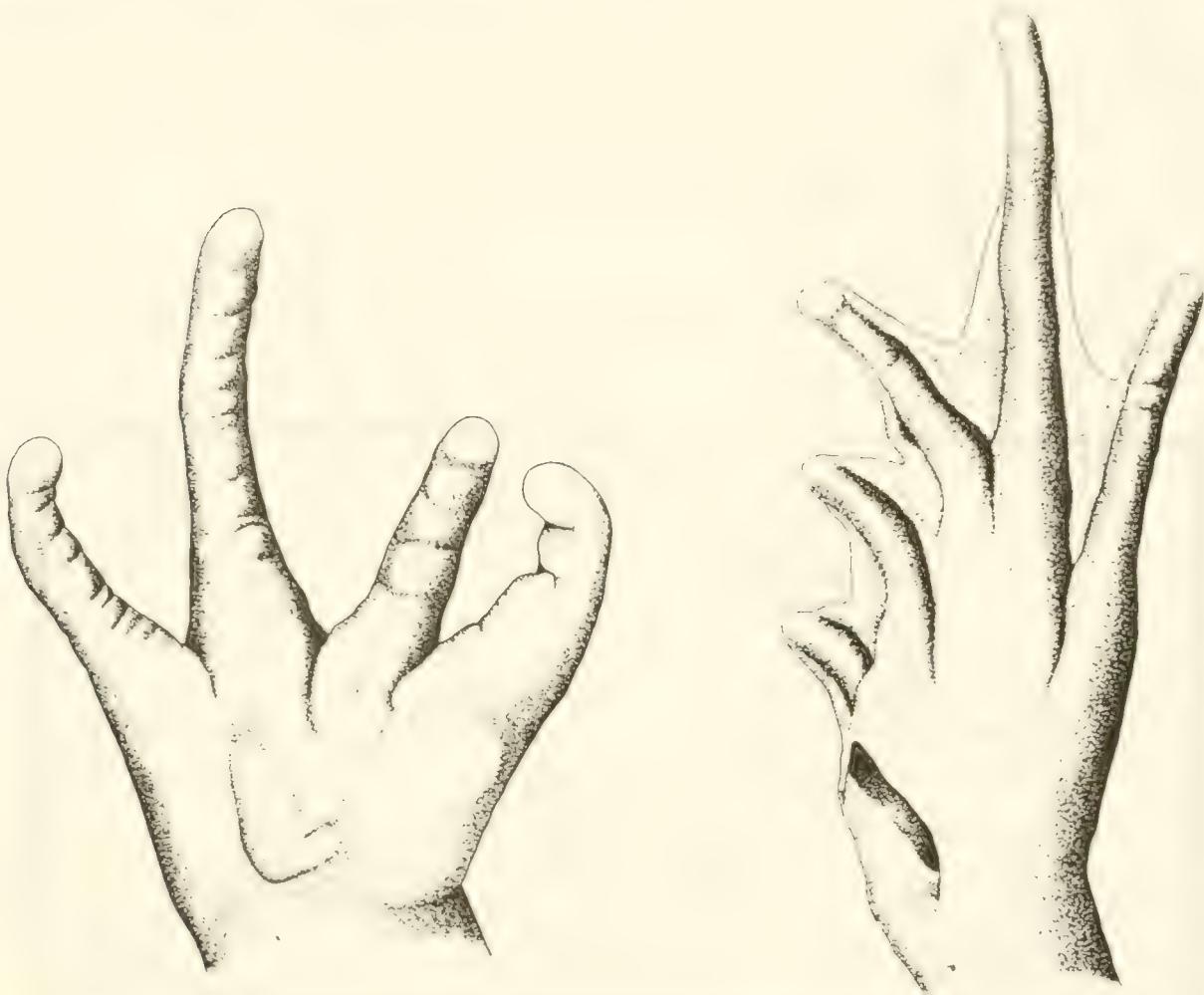


Fig. 11. Palmar view of hand (left) and plantar view of feet (right) of *Pelobates varaldii* (MVZ 162434).

#### Diagnosis

Toad with smooth skin, no dorsolateral glandular folds and no paratoid glands. Metatarsal spade keratinous. Pupil vertical and tympanum inconspicuous.

#### Size

Snout-vent lengths to 65 mm in males and 70 mm in females.

#### Description

Head wide, somewhat concave between eyes. Nostril

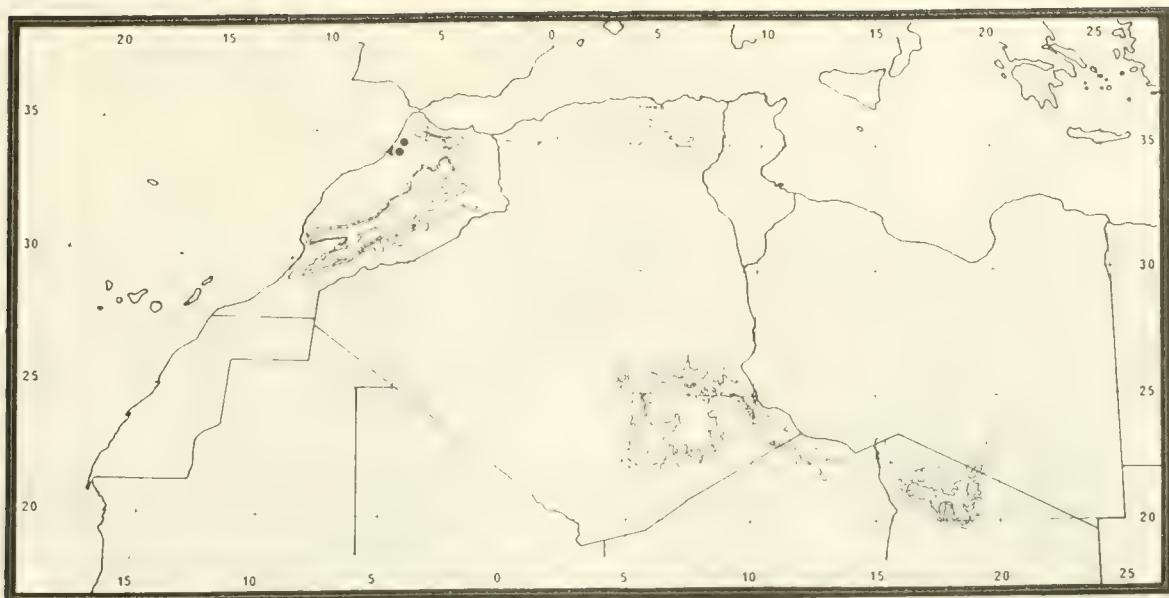


Fig. 12. Distribution of *Pelobates varaldii*.

equidistant between snout and anterior edge of eye. Eyes prominent, their horizontal diameter greater than distance between eye and nostril. Iris yellowish copper or greenish with black spots. Digits with no articular tubercles. Three inconspicuous palmar tubercles. Metatarsal tubercle blackish with whitish base. Skin smooth with small reddish warts on the eyelids and dorsum. Greyish brown dorsum with irregular dark spots. Venter whitish.

#### Variation

Some individuals have the metatarsal tubercle completely keratinized. Some individuals have red spots on the upper eyelid, but these are absent in other individuals.

#### Ecology

This toad is nocturnal and only active in autumn and winter. It spends the day buried in the soil and appears to be confined to sandy soils. Its diet is composed of diverse invertebrates.

#### Biology

Amplexus occurs in the water, and egg-laying takes 5-10 min. It breeds in temporary ponds. The eggs are laid in a string 1-1.5 m long. Eggs are dark grey, and each measure 1.15-2 mm in diameter. The larvae hatch at the latest within a week after laying. The tadpoles feed on plankton and detritus. Tadpoles reach 130 mm length. Metamorphosis takes place in May and June, and the young leave the water with stubby tails. Recently metamorphosed individuals measure 21-34 mm SVL.

#### Distribution

Plains of northwestern Morocco (Fig. 12).

#### Bibliography

Busack et al. (1985), Dorda (1984), Pasteur and Bons (1959).

### Family Hylidae

An arboreal anuran family, that typically has enlarged pads on the tips of the digits. Hylidae includes some 719 species. The pupil is usually horizontal. The eggs are generally laid in water, although in some tropical species there is parental care. In Africa, there is only one species - *Hyla meridionalis* - which lives in southern Europe, the Canary Islands and Northwest Africa.

#### ***Hyla meridionalis*** Boettger, 1874

(Figs. 13-14)

*Hyla arborea* var. *meridionalis* Boettger, 1874. Abh. Senck. Naturf. Ges., 9: 186. Boulenger, 1891:159. Pasteur and Bons 1959:168.

#### Diagnosis

With enlarged discs on the tip of digits. Colour green or yellowish with a small black spot behind the tympanum. Pupil horizontal.

#### Size

Snout-vent lengths to 46 mm in males and 50 mm in females.

#### Description

Head wider than high, with round snout. Tympanum conspicuous, its diameter about half eye diameter. Digits with enlarged terminal discs, larger on the fingers than on the toes. Third finger longest and first shortest. The second and fourth of equal length. Forefoot with subarticular tubercles but no palmar tubercles. Hindfoot with oval inner metatarsal tubercle and inconspicuous external tubercle. Skin smooth except on the throat and venter, granular on these areas. Colour yellowish green, sometimes with black spots on dorsum. Venter whitish. Black stripe from nostril to behind tympanum. Iris dark brown. Male with external gular vocal sac.

#### Variation

Unknown in the area.

#### Ecology

In Morocco, these frogs are found between 20 and 2650 m, typically in damp meadows, stagnant water, and cultivated fields. In Algeria, their diet consists of dipterans, neuropterans, and lepidopterans. In Morocco, they call nearly year around. After the breeding season, they are arboreal in spring, and their activity decreases towards summer. They are also seen in wet autumns in Algeria.

#### Biology

At low altitude in Morocco, breeding begins with the first

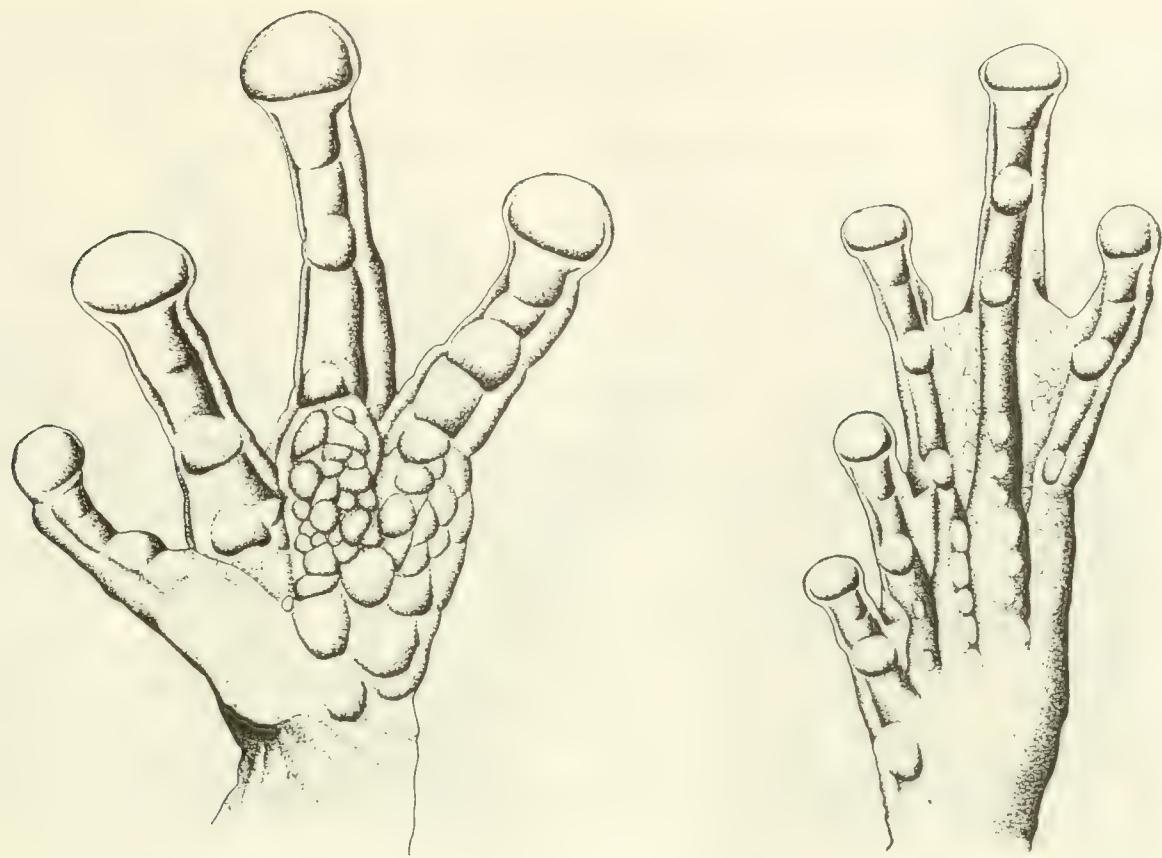


Fig. 13. Palmar view of hand (left) and plantar view of feet (right) of *Hyla meridionalis* (MVZ 186158).

autumn rains in November and continues until April. Males call from February or March until July at 2650 m in the Atlas mountains. Breeding occurs from February to April in Algeria. Most mating takes place at the end of March, and the metamorphosis takes place in May. The migration can be by day.

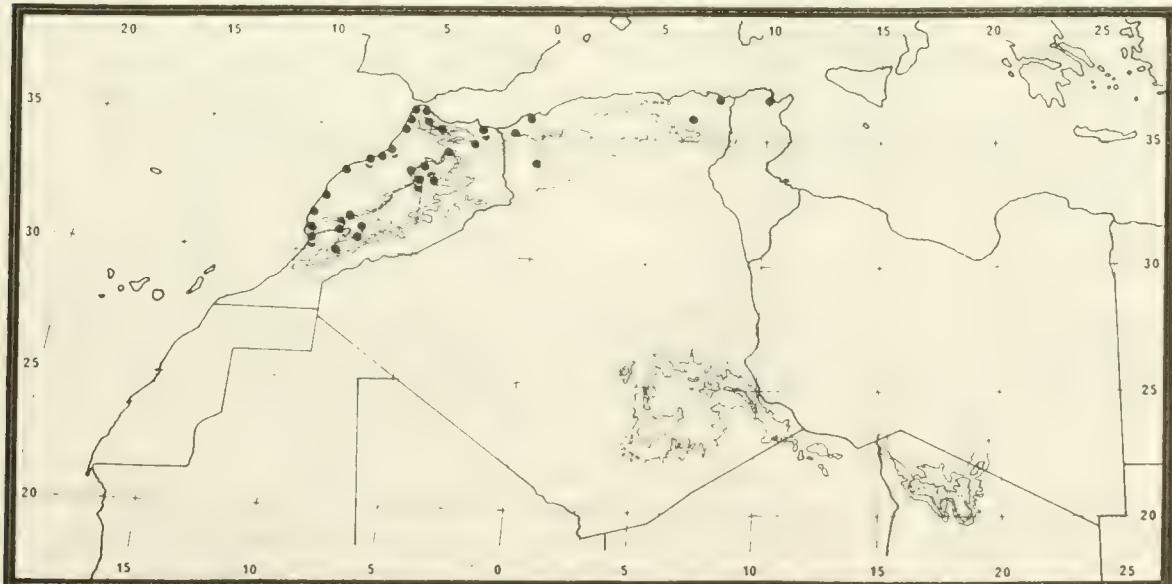


Fig. 14. Distribution of *Hyla meridionalis*.

Egg-laying is at night, and they usually breed in temporary ponds. The tadpoles reach 55 mm total length in Morocco.

~~1971-1972~~

Morocco, northern Algeria, and northern Tunisia (Fig. 14).

#### Bibliography

Doumergue (1901), Dubois (1982), Galán (1931), Pasteur and Bons (1959), Stemmler (1972), Stemmler and Hotz (1972), Werner (1971).

#### Family Bufonidae<sup>"</sup>

This family of true toads encompasses more than 365 living species, with an almost cosmopolitan distribution, absent only from Madagascar and the Australian region. Their skin is usually thick with numerous glands. Most have well developed paratoid glands on head. They are generally terrestrial or digging species. Most produce numerous small eggs.

Two species are endemic in North Africa: *Bufo mauritanicus* and *Bufo broningersmai*. Two widely distributed palaearctic species also live here, *Bufo bufo* and *Bufo viridis*. A species that lives south of the Sahara - *Bufo xeros* - is also present. In addition, *Bufo pentoni*, a sahelian species, occurs nearby and probably occurs here.

***Bufo bufo spinosus*** Daudin, 1803

(Figs. 6d, 15-16)

*Bufo vulgaris*: Boulenger, 1891:159. Doumergue, 1901:349.

*Bufo bufo spinosus*: Pasteur and Bons 1959:141.

#### Diagnosis

Large, uniform dark brown colour, sometimes yellowish toad. Without tarsal folds. Large tubercles present between corner of mouth and paratoid gland. No tibial gland. Distal subarticular tubercle of the fourth toe double. Posteriorly diverging paratoid glands. Small tympanum.

#### Size

Snout-vent lengths to 110 mm in males and 150 mm in females.

#### Description

Head very wide, with round snout. Interorbital space flat or somewhat concave. Tympanum conspicuous, its diameter less than half that of eye. Paratoid glands large and elongated diverging at their posterior end. Short digits, third longest; second and fourth of equal length and somewhat shorter than first. Skin warty.

Subarticular tubercles paired in fore and hindlimbs, although in old individuals fused. Two palmar tubercles and two metatarsal tubercles. Colour greyish brown, more or less pale, sometimes with dark patches on dorsum, sometimes yellowish or reddish. Venter yellowish or pale brown. Iris reddish or copper-coloured with black spots.

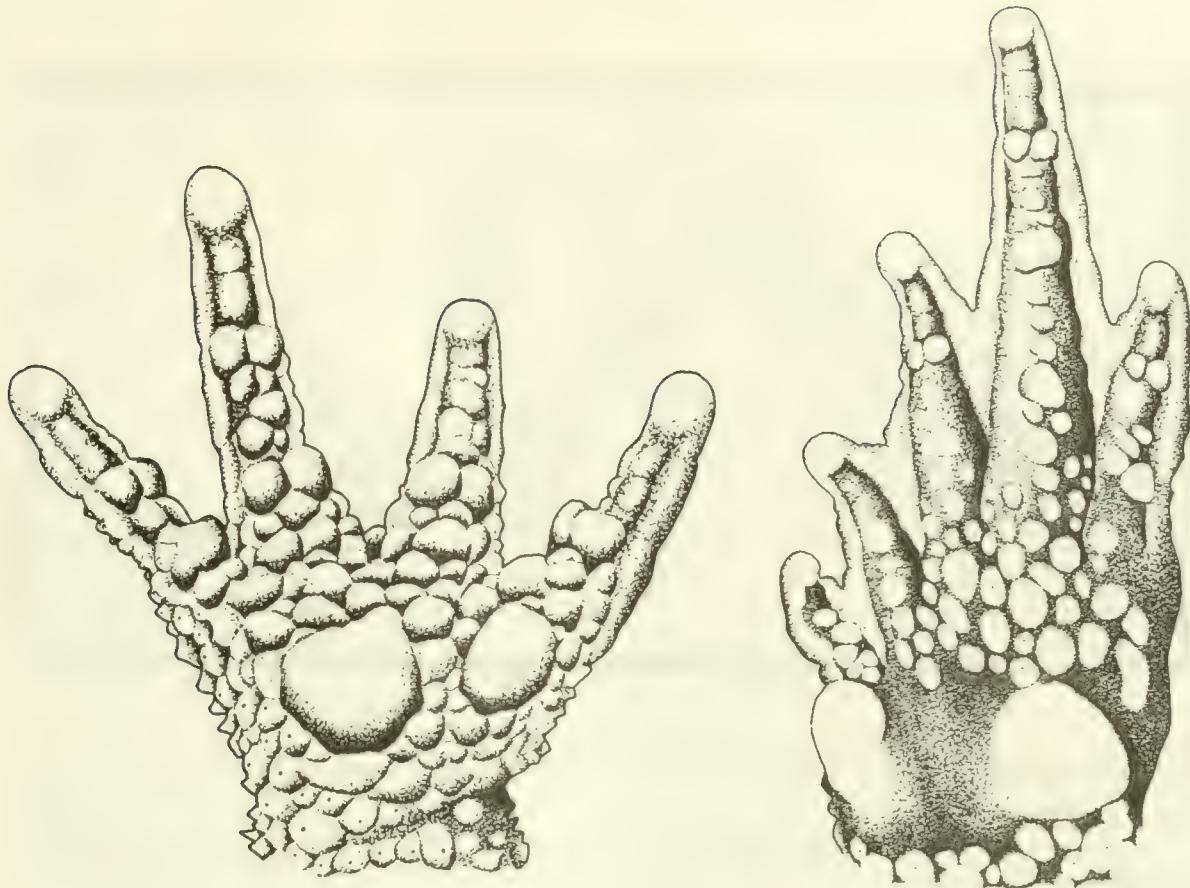


Fig. 15. Palmar view of hand (left, CM 58412) and plantar view of feet (right, MCZ 16244) of *Bufo bufo*.

#### Variation

The coloration varies between individuals from brown to greyish, greenish, olivaceous, reddish, and mauve. The North African populations are included in the subspecies *spinosis* Daudin, 1803, occurring in southern Europe and characterized by its large size and numerous warts.

#### Ecology

These toads live in humid areas near to permanent water. They usually live in the mountains of North Africa, although they also occur in the plains in northern Morocco. In the Moroccan Atlas, they reach 2650 m. In Tunisia, they usually live in areas of cork-oak forests. Their diet consist of insects, specially orthopterans.

#### Biology

Life history data is poorly known for North African populations. At 2650m in the Moroccan Atlas, breeding takes place in spring, because by July only metamorphic or metamorphosed individuals are found.

#### Distribution

Northern Algeria and northern Tunisia. In Morocco, they occur in the Atlas, Rif, and northwestern plains (Fig. 16).

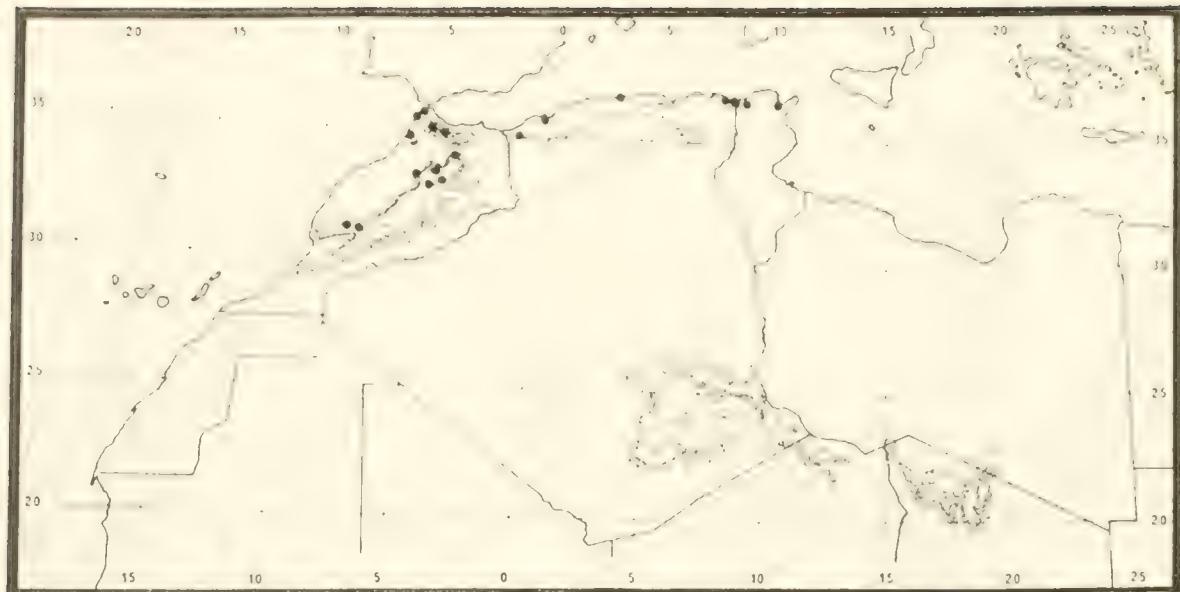


Fig. 16. Distribution of *Bufo bufo*.

#### Bibliography

Dubois (1982), Pasteur and Bons (1959), Schneider (1974), Stemmler (1972).

#### **Bufo bronigersmai** Hoogmoed, 1972

(Figs. 6a, 17-18)

*Bufo bronigersmai* Hoogmoed, 1972. Zool. Meded., Leiden, 47: 50.

#### Diagnosis

Small toad with small green patches on brownish grey dorsum. Pale vertebral line absent. Paratoid glands small, somewhat longer than wide, nearly round. Most distal subarticular tubercle of fourth digit double. No tibial glands. Tympanum nearly round. Head very flat and without warts.

#### Size

Snout-vent lengths to 51 mm in males and 48 mm in females.

#### Description

Snout round. Head 2.5 times as long as high. Horizontal diameter of eye is slightly less than distance between eye and snout and 2.5 times horizontal diameter of the tympanum. Interorbital space flat. Subarticular tubercles on digits single except for distal ones often double. Subarticular tubercles on toes single except for double distal one of third and distal two of the fourth.

Dorsum pale brown grey with small green patches and black spots. Paratoid glands, upper eyelids and dorsal warts reddish. Venter white with green spots. Iris green.

#### Variation

The paratoid glands measure in length 1 to 1.8 times their width. No geographical variation has been described.

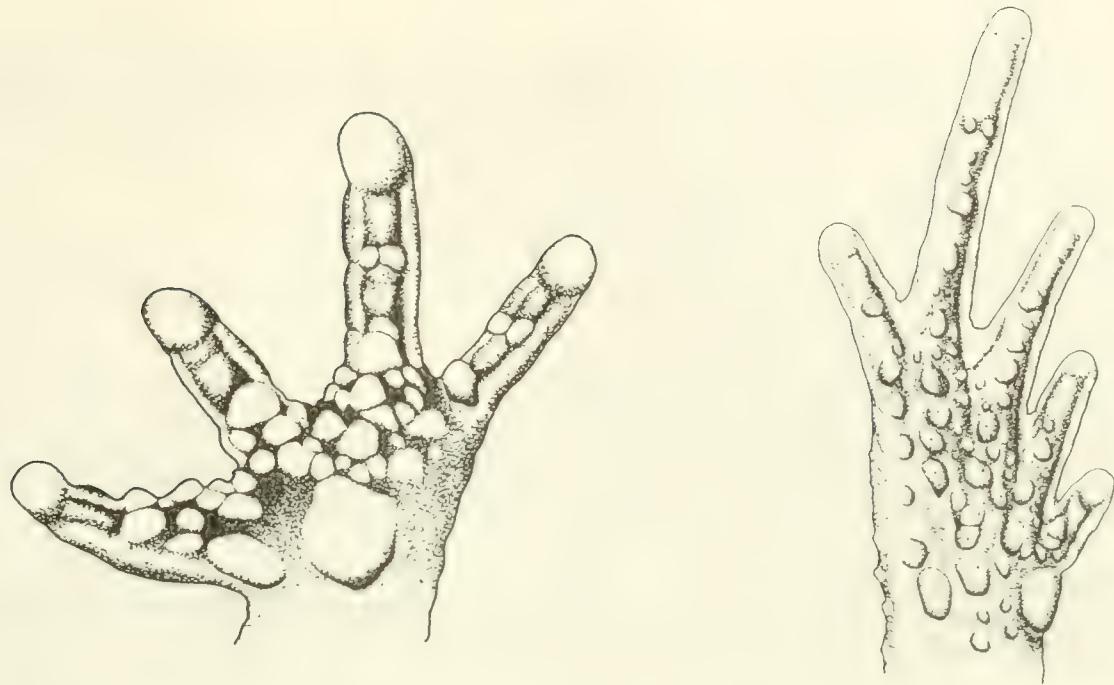


Fig. 17. Palmar view of hand (left) and plantar view of feet (right) of *Bufo brongersmai* (NMW 17221).

#### Ecology

This species lives in semiarid areas with *Argania*, *Euphorbia*, and graminaceous vegetation. It is found between altitudes of 171 and 1000 m. During the day, individuals rest beneath stones.

#### Biology

Males have been seen calling in the water in daytime on

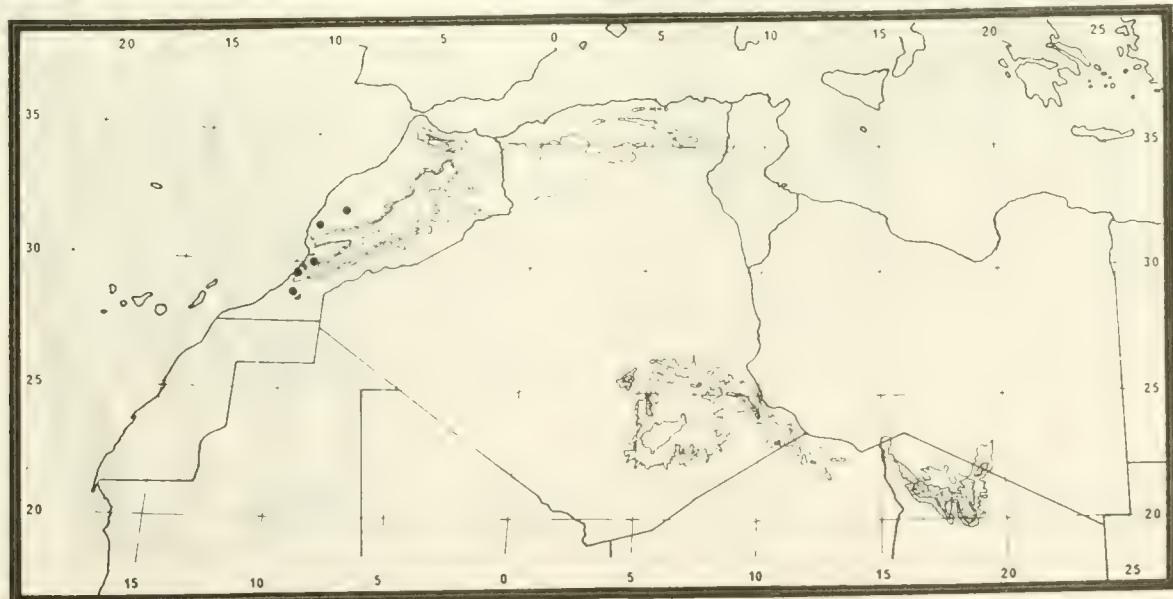


Fig. 18. Distribution of *Bufo brongersmai*.

the 19th of March. In this site, there were already tadpoles hatching (de Riva, 1992).

#### Distribution

Southwestern Morocco (Fig. 18).

#### Bibliography

De la Riva (1992), Destre et al. (1989), Hoenigsmid (1972), Grillitsch et al. (1989).

**Bufo mauritanicus** Schlegel, 1841

Figs. 6-, 19-20

*Bufo mauritanicus* Schlegel, 1841. In: Wagner, Reisen Algier, 3:134. Boulenger, 1891:158. Pasteur and Bons 1959: 156.

#### Diagnosis

Large toad with large brown patches bordered with black on

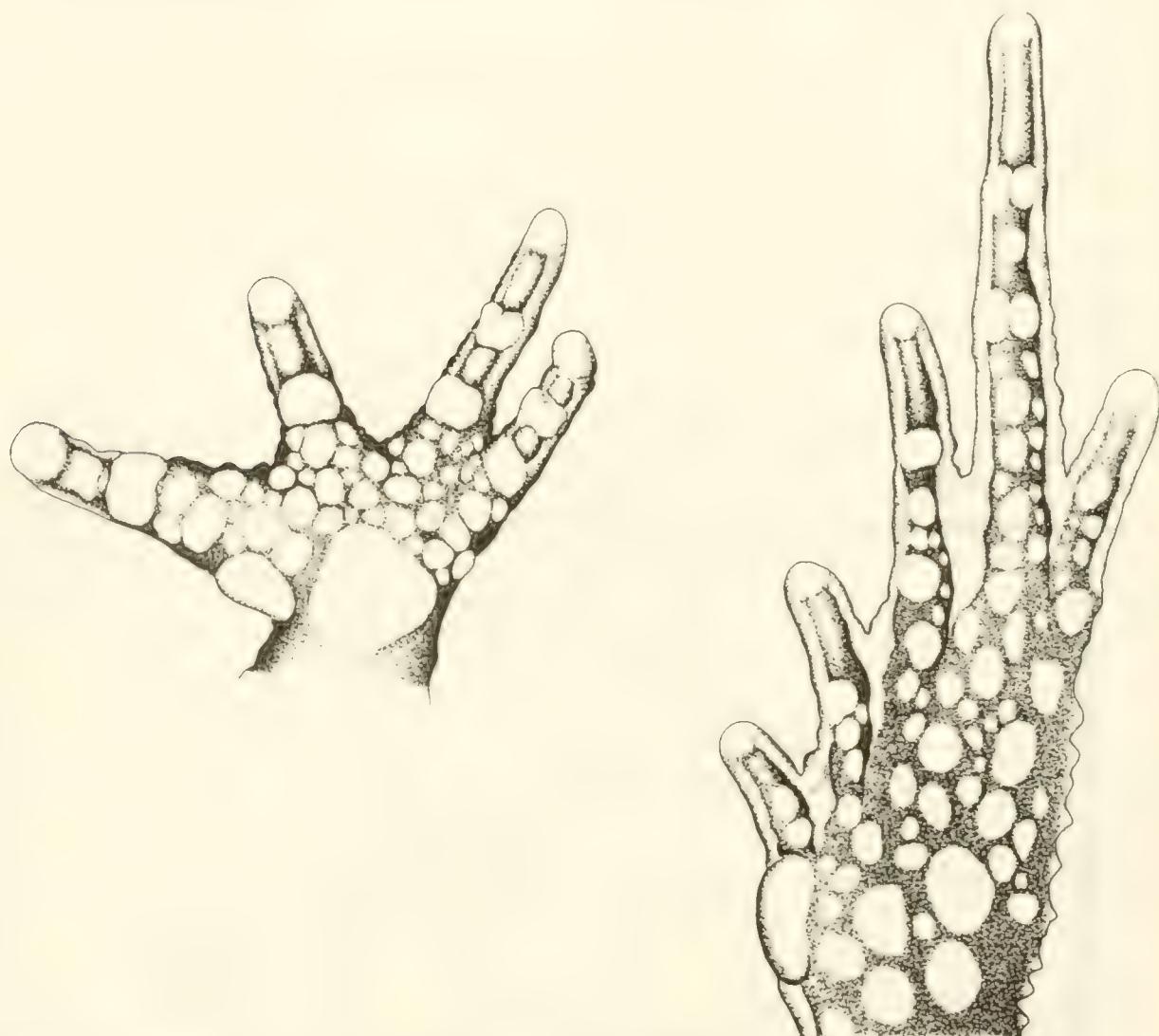


Fig. 19. Palmar view of hand (left, AMNH 103708) and plantar view of feet (right, USNM 196374) of *Bufo mauritanicus*.

the dorsum. Tympanum large and interorbital space concave. Paratoid glands kidney-shaped and parallel. Tarsal fold present. Distal subarticular tubercle on fourth toe double.

#### Size

Snout-vent lengths to 132 mm in males and 150 mm in females.

#### Description

Subarticular tubercles, double in young, single in adults. Paratoid glands large and elongated, parallel in young and somewhat divergent posteriorly in adults. Dorsal patches brown to olive, orange, and reddish brown.

#### Variation

Clinal variation of the dorsal pattern of patches has been described in Morocco and Tunisia. Towards the south the patches tend to disappear and the dorsum becomes an uniform sandy colour.

#### Ecology

This toad lives in a great variety of habitats, from rocky and stony places with permanent or temporary water, damp meadows, and coastal dunes, to scrub of *Chamaerops humilis*, *Pistacia lentiscus*, and *Olea europaea*. In Morocco, it lives from sea level to 2650 m. During the day, the toads remain beneath rocks or in tunnels. The diet is varied and includes scorpions, although coleopterans dominate.

#### Biology

They call year around, and day and night. They breed in fresh or brackish water. The breeding period varies depending on region. It might not breed in some years in the pre-Saharan. In Algeria, egg laying lasts from the beginning of April to the middle of May. Isolated laying is recorded in summer. In Morocco, there is an early breeding period in January and another more generalized one in April. However in the Atlas and the Rif mountains, amplexus is delayed until June. Breeding occurs between March and April and July and September in Tunisia. Breeding migrations may be as much as 2 km. Egg laying takes place at night. The eggs are laid in four strings; egg diameter is 1.4-1.7 mm, and they number 5000 to 10000 per female. The larval period lasts some 45 days, and tadpoles do not exceed 30 mm total length. At the time of metamorphosis, they measure 10-12 mm SVL.

#### Distribution

Morocco, northern Algeria and Tunisia (Fig. 20). Old records in the Adrar mountains (Mauritania), Air (Niger), Hoggar (Algeria), and Tassili N'Ajjer (Algeria) probably result from confusion with *Bufo xeros*.

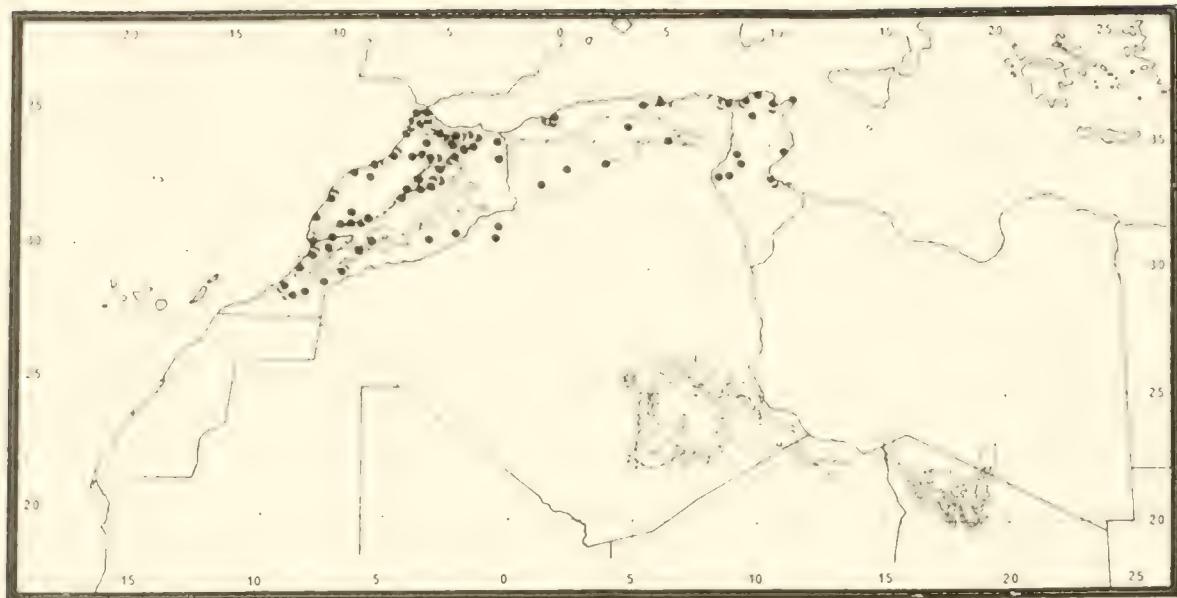


Fig. 20. Distribution of *Bufo mauritanicus*.

#### Bibliography

Altes and Siboulet (1978), Angel and Lhote (1938), Bellairs and Shute (1954), Cloudsley-Thomson (1974), Doumergue (1901), Dubois (1982), Galán (1931), Malkmus (1981), Meek (1983), Pasteur and Bons (1959), Schneider (1978), Stemmler (1972) Guibé (1950), Dekeyser and Villiers (1956).

#### ***Bufo viridis*** Laurenti, 1768

(Figs. 6b, 21-22)

*Bufo boulengeri* Lataste, 1879. Rev. Int. Sci.:438.

*Bufo viridis*: Boulenger, 1891:158. Scortecci, 1936:163. Pasteur and Bons, 1959:149.

#### Diagnosis

Medium-sized toad, green dorsum with irregular dark patches. Tympanum small. Tarsal fold present. Paratoid glands elongated and parallel. Distal subarticular tubercle of fourth toe single. Tibial gland present. Interorbital region flattened.

#### Size

Snout-vent lengths to 91 mm in males and 104 mm in females.

#### Description

Wide head with smooth and narrow interorbital space. Tympanum diameter 0.3-0.5 that of the eye. Short digits. Subarticular tubercles of fore- and hindlimbs single. Two palmar and two metatarsal tubercles. Dorsal patches are reddish brown in young and dark green in adults; patches bordered with black or with no dark border. Iris metallic greenish yellow spotted with black. Belly whitish, with small blackish spots.

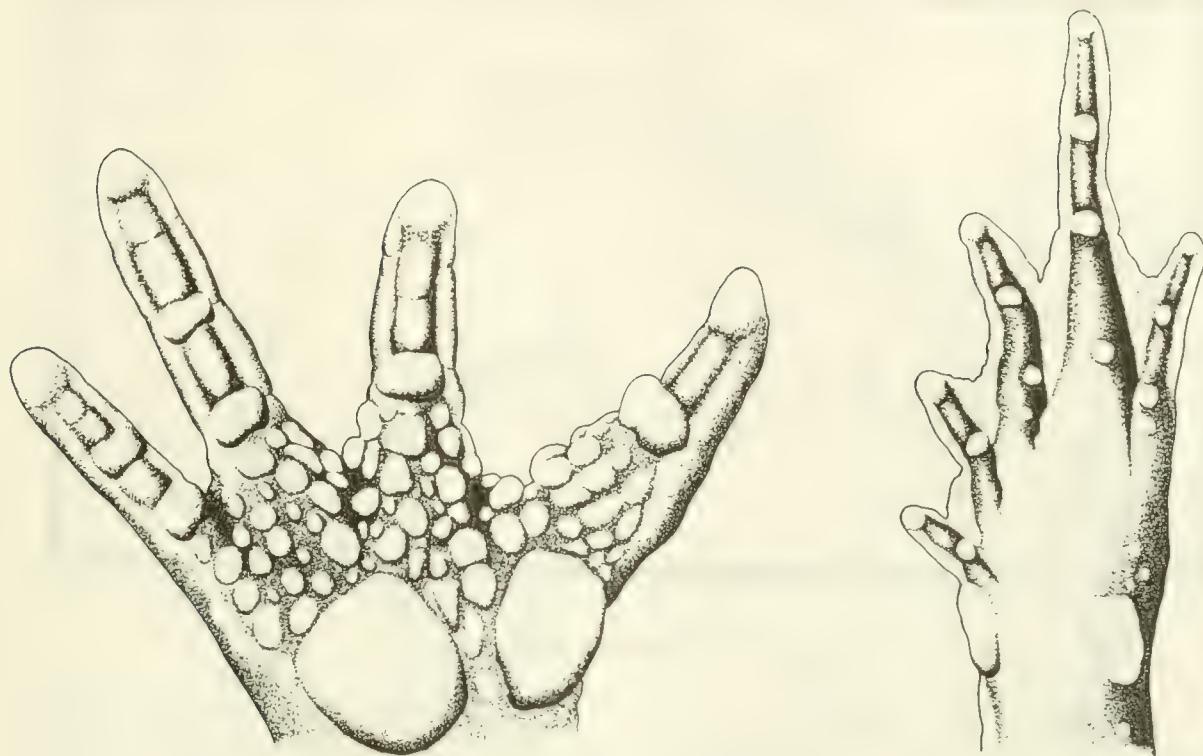


Fig. 21. Palmar view of hand (left, AMNH 52838) and plantar view of feet (right, USNM 195279) of *Bufo viridis*.

#### Variation

The populations of Morocco, Algeria and western Libya have a pale vertebral line, a relatively short tibia, and relatively short tibial and paratoid glands. The taxon *boulengeri* Lataste, 1879 can be applied to these populations. Populations of Algerian Sahara have the smallest SVL in North Africa.

#### Ecology

These toads live in open areas and takes refuge in burrows or beneath rocks. In Algeria, they are active year around and in Libya from March to December. In Morocco, they reach 2300 m in *Cedrus atlantica* forest. In arid Saharan areas, they occur in the vicinity of oases. In the Hoggar mountains, they live at 1400-2500 m next to permanent streams. They eat snails, worms, and insects, specially coleopterans. In Libya, densities of 113 individuals per hectare have been estimated in gardens and cultivated fields.

#### Biology

In North Africa, they usually breeds from February to May. Another breeding period, August to September is also recorded in Tunisia. After rains, they breed in any season in the Hoggar mountains; amplexus was observed in April, June, and August. Tadpoles have been found in September. In Libya, laying takes place from the end of February to the end of April, although amplexus has also been seen in September and tadpoles in January.

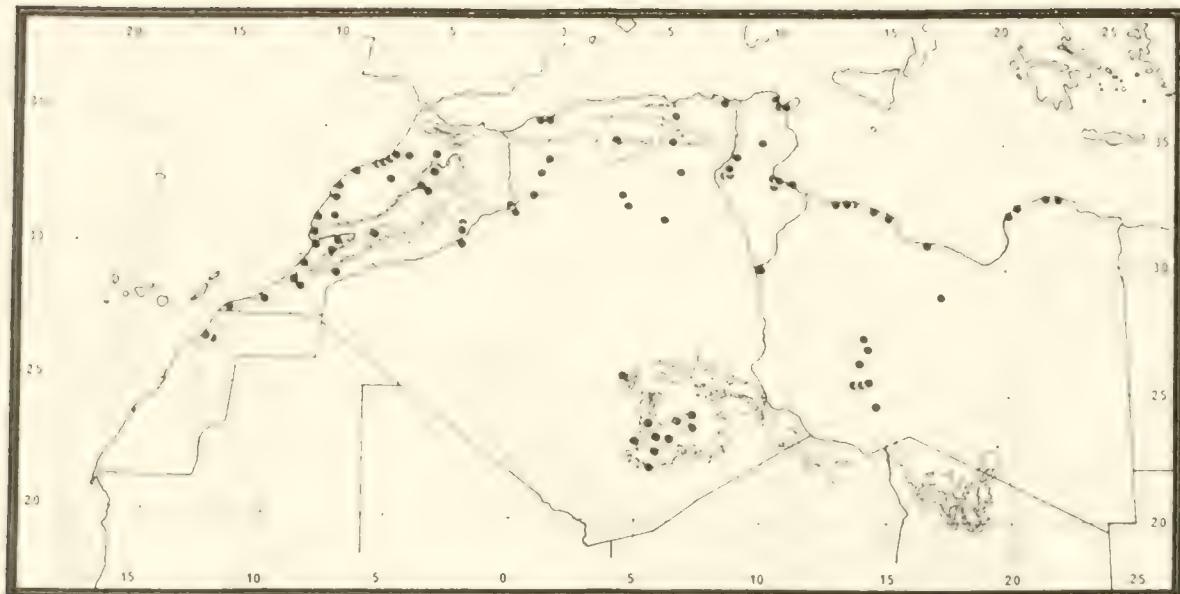


Fig. 22. Distribution of *Bufo viridis*.

During the breeding season, green toads are aquatic and active by day. The eggs are arranged in two strings. The tadpole reaches 62 mm total length and measures 15-20 mm SVL at the time of metamorphosis. In Libya, tadpoles have been observed making cup depressions at the bottom of pools.

#### Distribution

Morocco, north of western Sahara, Algeria, Tunisia, and Libya (Fig. 22).

#### Bibliography

Angel (1944), Angel and Lhote (1938), Blanc and Nouira (1988), Boulenger (1891), Doumergue (1901), García París and López Jurado (1990), Grover (1971), Hoogmoed (1972), Mertens (1929), Pasteur and Bons (1959), Pellegrin (1927, 1934), Scortecci (1936), Schleich (1987), Schnurrenberger (1962), Stemmler and Hotz (1972), Werner (1914), Zavattari (1934).

***Bufo xeros*** Tandy, Tandy and Duff-MacKay, 1976 Figs. 6e, 23-24)

*Bufo regularis*: Scortecci, 1936:143.

*Bufo xeros* Tandy, Tandy and Duff-Mackay, 1976. Pearce-Sellards Ser., Texas Mem. Mus., 24: 3.

#### Diagnosis

Toad with elongated, narrow and diverging paratoid glands. Tympanum relatively large and rounded. Tarsal fold present. Subarticular tubercles single. Yellowish brown colour with reddish spots in the posterior femoral region. Six pairs of dark, nearly rectangular spots on the head and dorsum.

#### Size

Snout-vent lengths to 82 mm in males and 97 mm in females.

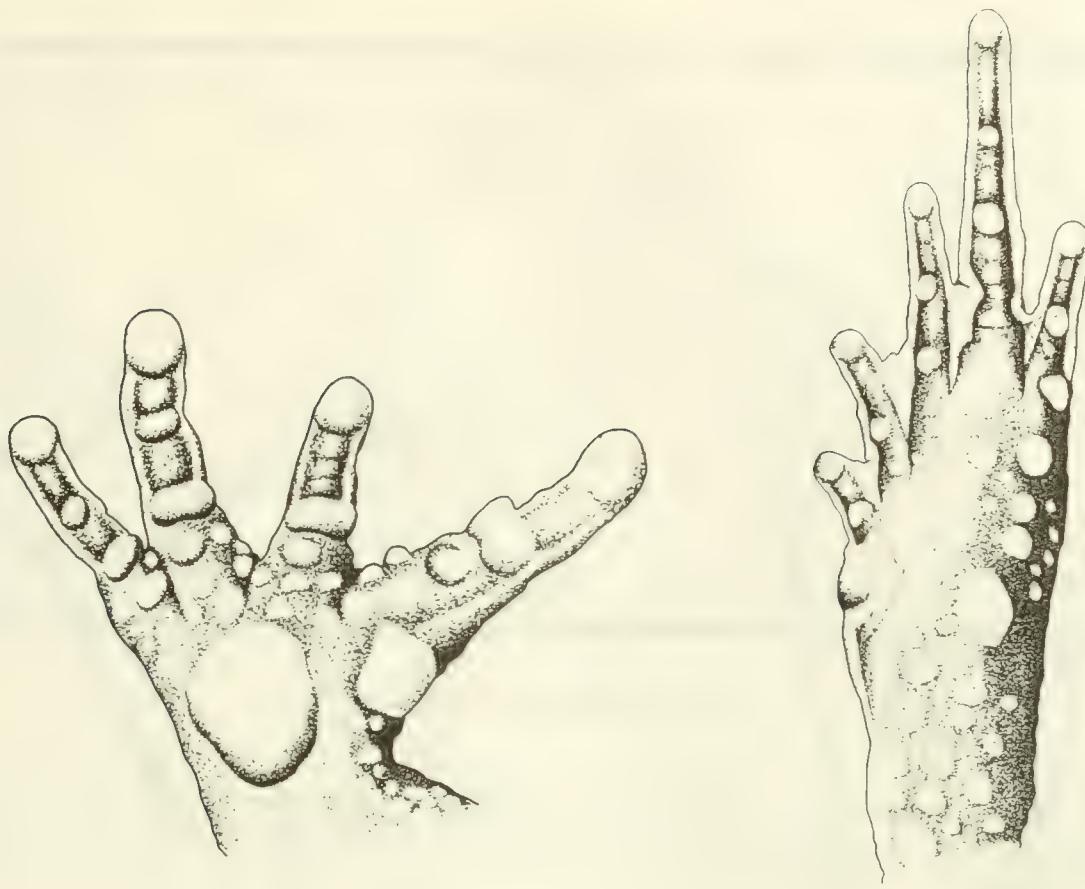


Fig. 23. Palmar view of hand (left) and plantar view of feet (right) of *Bufo xeros* (CAS 138523).

#### Description

Head longer than wide. Tympanum vertically oval, its horizontal diameter 0.6 times that of eye. Paratoid glands elongated and narrow, divergent at the extremes. Subarticular tubercles wide, usually single, occasionally double. Forelimb with elongated gland on posterior surface. Tarsal fold well developed. Upperparts olivaceous brown, greyish or yellowish, with six pairs of dark brown spots on the head and dorsum. Paratoid glands are yellowish. Belly cream coloured, greyish brown on the throat of males.

#### Variation

Outside the North Africa, geographical variation in call, size and colouration has been recognized. No nominal taxon has been described within the area, and no subspecies are currently recognized.

#### Ecology

Individuals observed active from September to March. Their diet is composed of arachnids and insects, specially coleopterans. They are active at night, and in the breeding season, they are also active during the day. They are found in oases and in pools of water for livestock.

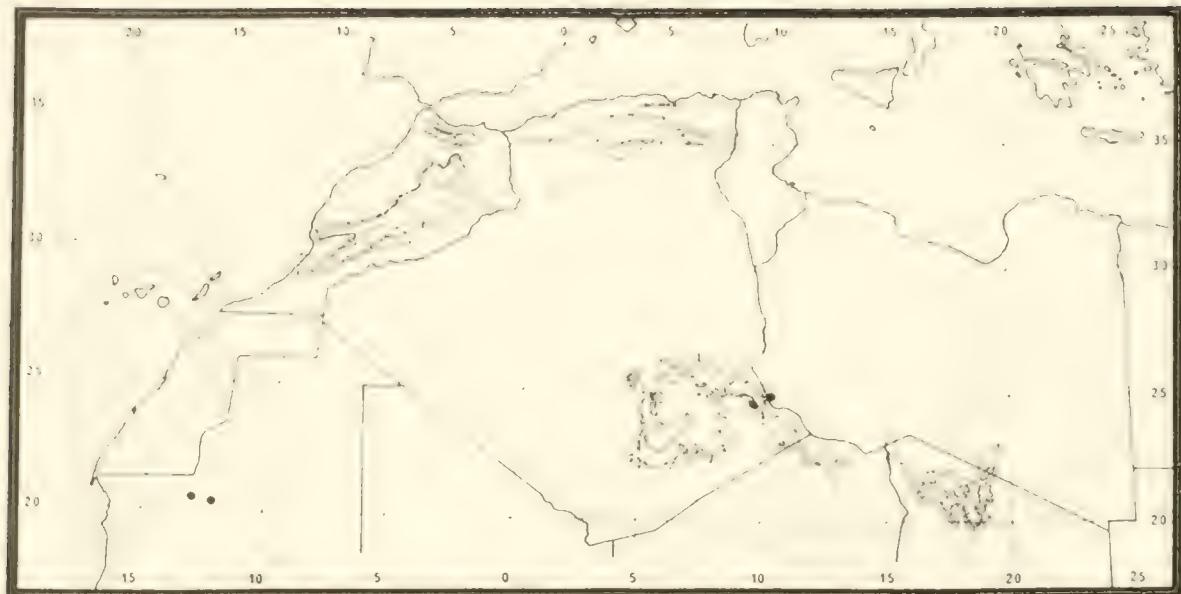


Fig. 24. Distribution of *Bufo xeros*.

#### Biology

They breeds in September-October and February-March. The tadpole reaches 34 mm total length. Metamorphosed individuals measure 10.5-15 mm SVL.

#### Distribution

A species of semiarid regions south of the Sahara, also found in the mountains of Hoggar (Algeria), Air (Niger), and Adrar (Mauritania) (Fig. 24).

#### Bibliography

Angel (1944), Angel and Lhote (1938), Dekeyser and Villiers (1956), Joger (1981), Guibé (1950), Lavauden (1926), Scortecci (1936), Siboulet (1969), Tandy et al. (1976).

#### ***Bufo pentoni*** Anderson, 1893

(Figs. 6f, 25-26)

*Bufo pentoni* Anderson, 1893. Ann. Mag. Nat. Hist., (6) 12: 440.

#### Diagnosis

Small, brownish coloured toad. Paratoid glands conspicuous, nearly parallel, somewhat separated posteriorly. Tympanum higher than wide. Three very conspicuous digging tubercles, one tarsal and two metatarsal.

#### Size

Snout-vent lengths to 64 mm in males and 75 mm in females.

#### Description

With large central palmar tubercle and another reduced one on first finger. Subarticular tubercles single except doubled distal one of fourth finger. Breeding male with conspicuous

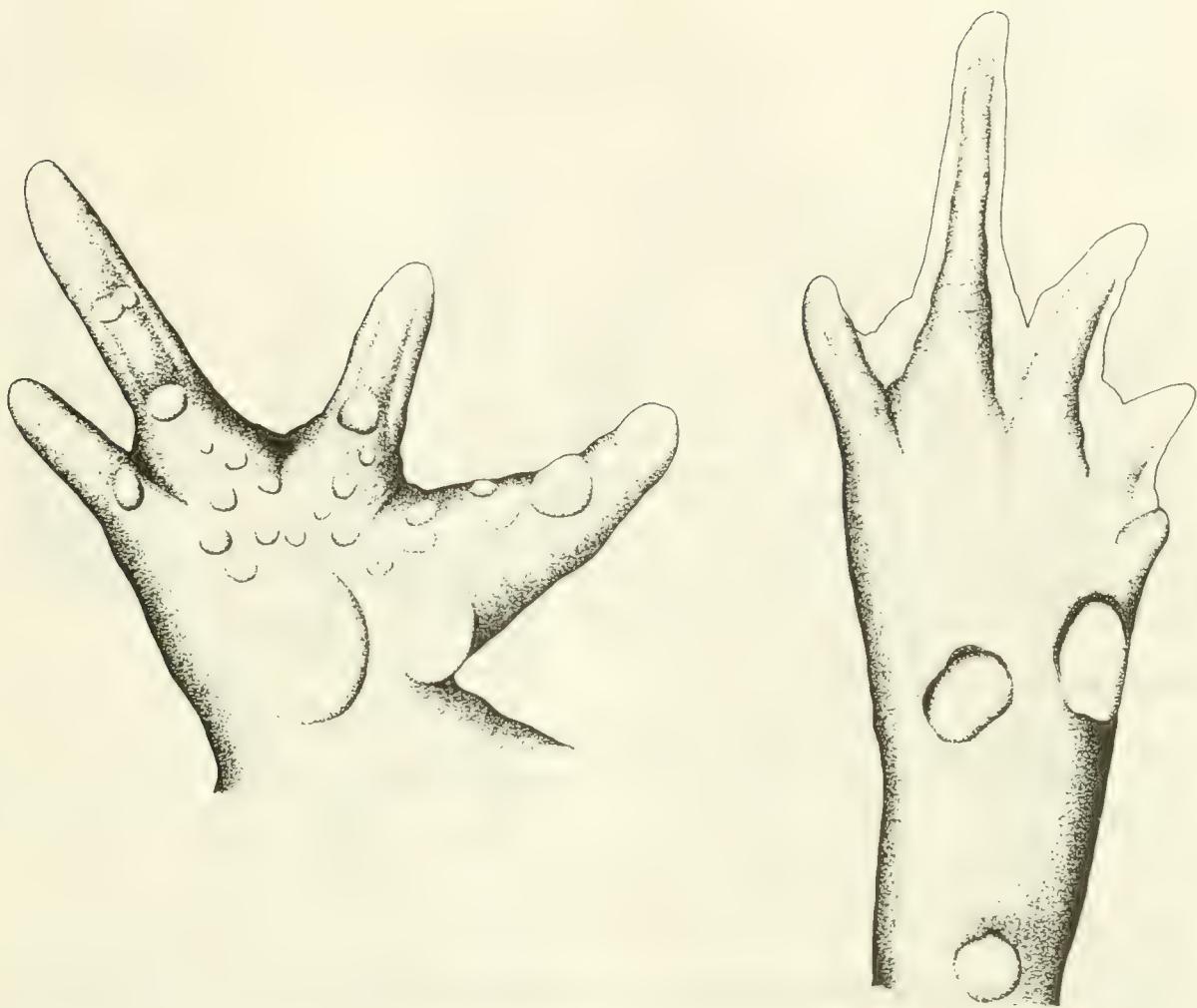


Fig. 25. Palmar view of hand (left) and plantar view of feet (right) of *Bufo pentoni* (BM 1913.5.9.79).

spines on the warts. Dorsum brown, usually pale. Venter whitish. Dark spots usually evident on back of juveniles.

#### Ecology

They breed in temporary pools that form with the first rains of summer. They aestivate for very long periods.

#### Biology

They reach sexual maturity at two years old, and can live at least six years. During the first two years, growth is rapid and later very slow. In the first months after metamorphosis, individuals grow at a daily rate of 0.53 mm. The survival of larvae and young is low and varies from one year to another. The age structure is heterogeneous, probable due to the annual variability in recruitment.

#### Distribution

South of the Sahara from Mauritania to Ethiopia and Arabia. Also in the Sahara, at the Trarza region (Mauritania), and Air mountains (Niger).

## Bibliography

Balletto and Cherchi (1973), Barbault et al. (1979), Forge and Barbault (1977), Francillon et al. (1984), Guibé (1950), Joger (1981).

## Family Ranidae

A large anuran family containing more than 625 species that live on every continent. For the most part, they are aquatic and have long hindlimbs with extensive webs. They usually deposit their eggs in still waters.

In North Africa, *Rana saharica* is an endemic species. Eastern Libyan records of *R. saharica* could belong to *Rana levantina* Schneider, Sinsch, and Nevo 1992, recorded from the Nile delta. Two Ethiopian species also live in the area: *Hoplobatrachus occipitalis* and *Tomopterna cryptotis*. The first has the appearance of a frog and is aquatic whereas the second resembles a toad and is fossorial.

### ***Rana saharica*** Boulenger, 1913

(Figs. 27-28)

*Rana esculenta*: Boulenger, 1891:157.

*Rana esculenta* var. *saharica* Boulenger, 1913. Novit. Zool., 20:84.

*Rana esculenta ridibunda*: Doumergue, 1901:332. Scortecci, 1936:131. Pasteur and Bons 1959:188.

*Rana zavattarii* Scortecci, 1936. Atti Soc. Ital. Sci. Nat., 75:135.

*Rana ridibunda riodeoroi* Salvador and Peris, 1975. Bol. Est. Centr. Ecol., 8:49.

### Diagnosis

Frog with dorsolateral glandular folds and strongly webbed hindfeet. Single subarticular tubercles.

### Size

Snout-vent lengths to 86 mm in males and to 105 mm in females.

### Description

Head as wide as long, with oval snout. Eyes big and projecting, dorsally placed. Tympanum circular, with diameter 0.7-0.9 that of the eye. Adpressed hindlimb to tympanum or snout. Internal metatarsal tubercle on heel, not projecting beyond base of first toe. Sometimes there is a small tarsal tubercle on the prolongation of the fourth toe. Subarticular tubercles small and single. Webbing between toes. Skin shiny; dorsum somewhat warty, venter smooth. Glandular dorsolateral fold well-developed. Coloration variable; dorsum green, brown, or grey; dark spots on dorsum and limbs. Venter whitish with dark spots. Iris yellowish copper or metallic yellowish green.

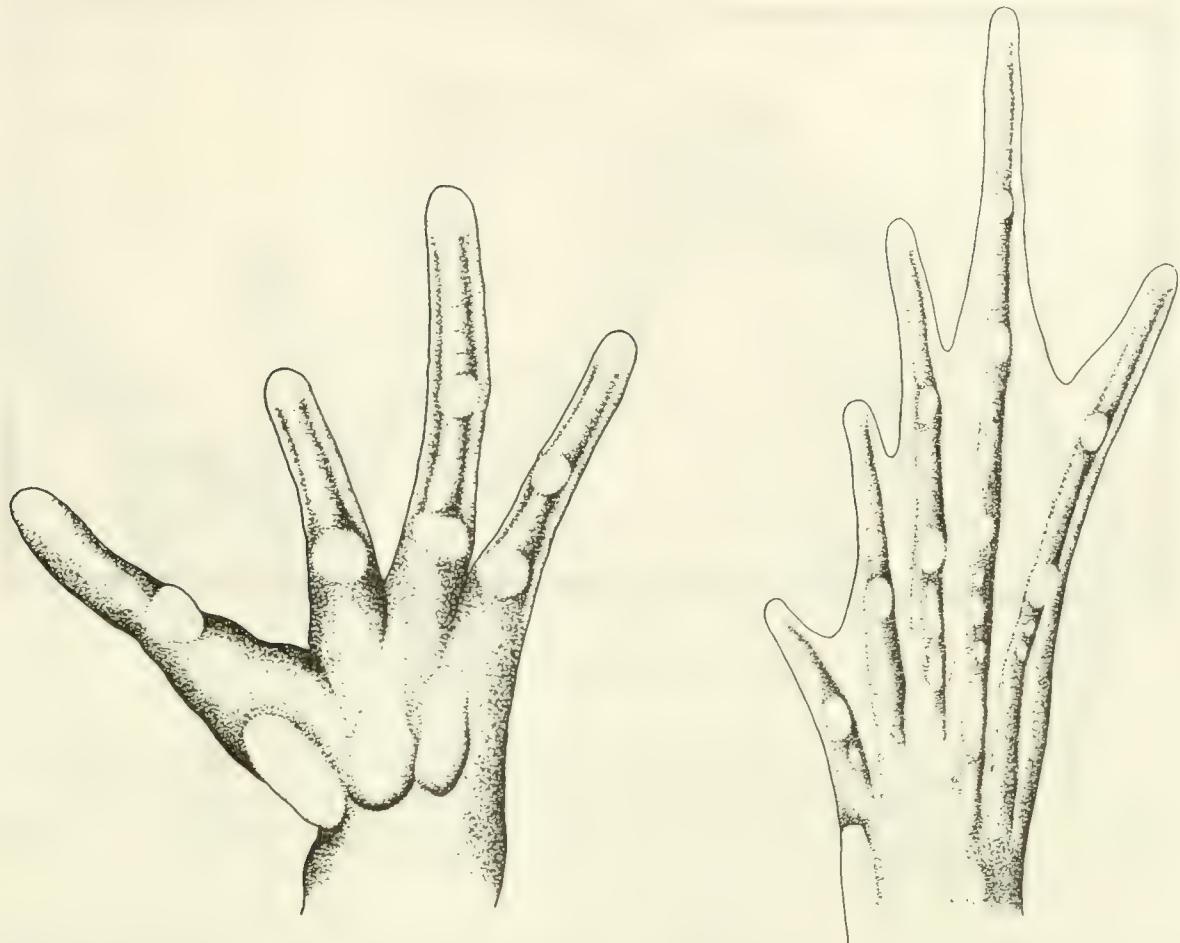


Fig. 27. Palmar view of hand (left) and plantar view of feet (right) of *Rana saharica* (LACM 108988).

#### Variation

The dorsal pattern and size show geographical variation. The Saharan populations usually lack a pale vertebral line and their coloration is greyish brown. Size (SVL) decreases southward.

#### Ecology

This is an aquatic species, living in irrigation ditches, ponds, springs, rivers, and temporary pools. It occurs from 20 to 1700 m in Morocco. In the northern Algeria and Morocco, the young are active by February, the adults in April. Their diet in Algeria is composed of insects, tadpoles, fish, and fish eggs. The predation of *Hyla meridionalis* by this species has been reported.

#### Biology

Amplexus occurs in May (western Sahara) or June (Algeria). Tadpoles reach 70 mm total length (Morocco). If they overwinter, they reach 100 mm. The individuals that metamorphose in the year in which they hatch measure 12-14 mm SVL. Those that metamorphose the following year measure 20 mm SVL.

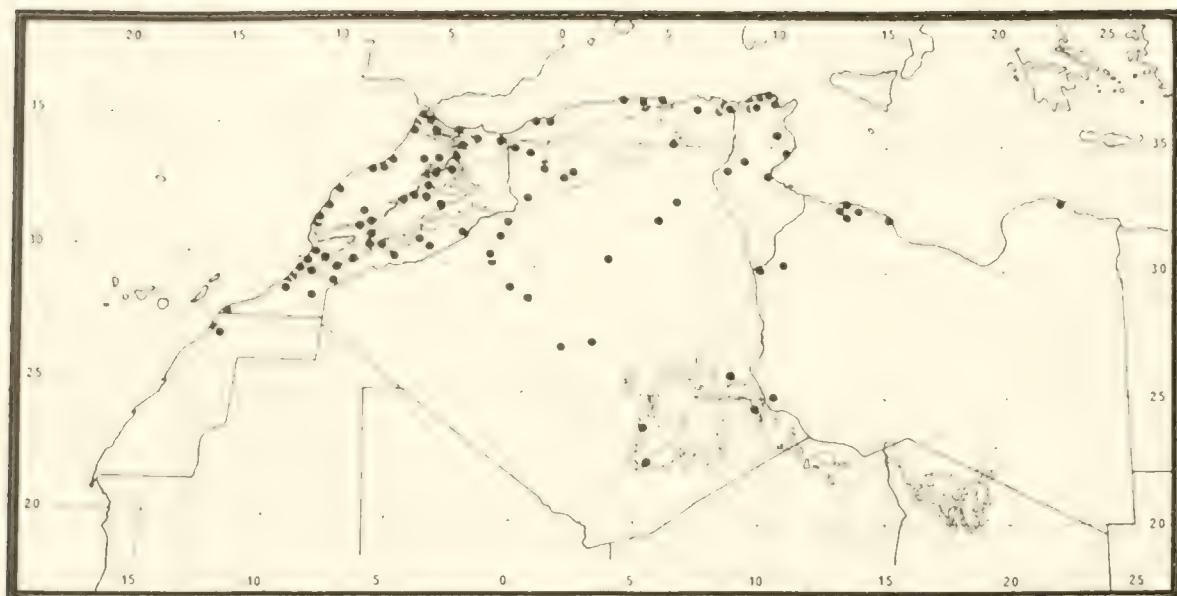


Fig. 28. Distribution of *Rana saharica*.

#### Distribution

North of western Sahara, Morocco, Algeria, Tunisia, and Libya. In the northern Sahara, their presence is limited to oases. They are also found in the mountains of Hoggar (Algeria) and Tassili N'Ajjer (Algeria) (Fig. 28).

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#### *Hoplobatrachus occipitalis* (Gunther, 1859)

(Figs. 29-30)

*Rana occipitalis*: Scortecci, 1936:139.

*Rana tigrina occipitalis*: Dekeyser and Villiers, 1956:40.

*Hoplobatrachus occipitalis*: Dubois, 1992:315.

#### Diagnosis

Large frog without dorsolateral glandular folds and with scattered warts on dorsum and flanks. Extensive webbing on hindfeet, including beyond the first and last toe. Only one subarticular tubercle at base of fingers; two or more subarticular tubercles on hindfeet. Single inner metatarsal tubercle. Pale occipital patch contacting eyes from behind.

#### Size

Snout-vent lengths to 85 mm in males and to 115 mm in females.



Fig 29. Palmar view of hand (left) and plantar view of feet (right) of *Hoplobatrachus occipitalis* (MZUF 16466).

#### Description

Large frog. Head very broad with dorsal eyes. Tympanum round with diameter about equal to horizontal diameter of eye. Forelimbs short; third digit longest and second the shortest, first and fourth digits subequal. One tubercle at base of each finger. Distinct palmar tubercle on first finger. Large hindlegs, with extensive webbing between and even outside toes. One or more subarticular tubercles on each digit. Single, large metatarsal tubercle.

Pupil rhomboidal. Iris blackish golden with reddish dots. Dorsum brilliant green or brownish. Flanks yellowish and belly whitish. Lips yellow or red with green or black transverse bars. Dorsum with irregular brownish or green spots outlined in black; some scattered yellow spots. Black postocular stripe from eye to corner of mouth. Venter spotted with greenish brown.

#### Variation

Northern specimens are larger and paler.

#### Ecology

In North Africa, *H. occipitalis* is found in oases in mountainous regions, where it lives in wells and cisterns. Active by day and night. They feed on coleopterans and



Fig. 30. Distribution of *Hoplobatrachus occipitalis*.

orthopterans, toads (*Bufo xeros*) and their tadpoles, and even individuals of their own species. During winter, they are inactive.

#### Biology

The call is a prolonged mooing. They are very active in September-October during which breeding seems to occur. In Senegal, they are sexually inactive during the dry season.

#### Distribution

An Ethiopian species, occupying isolated enclaves in northwestern Africa: southwestern Libya, Adrar (Mauritania), Adrar des Iforas (Mali), and Air mountains (Niger) (Fig. 30).

#### Bibliography

Angel and Lhote (1938), Böhme (1978a, 1978b), Dekeyser and Villiers (1956), Joger (1981), Micha (1975), Lamotte and Zuber-Vogeli (1954), Scortecci (1936).

#### ***Tomopterna cryptotis* (Boulenger, 1907)**

(Figs. 31-32)

*Pyxicephalus delalandii*: Guibé, 1950:330.

*Pyxicephalus* sp.: Dekeyser and Villiers, 1956:40.

#### Diagnosis

Toad-like but without paratoid glands. Pupil horizontal. Large inner metatarsal tubercle for digging. Generally with three pale longitudinal lines on the dorsum.

#### Size

Snout-vent lengths to 64 mm.

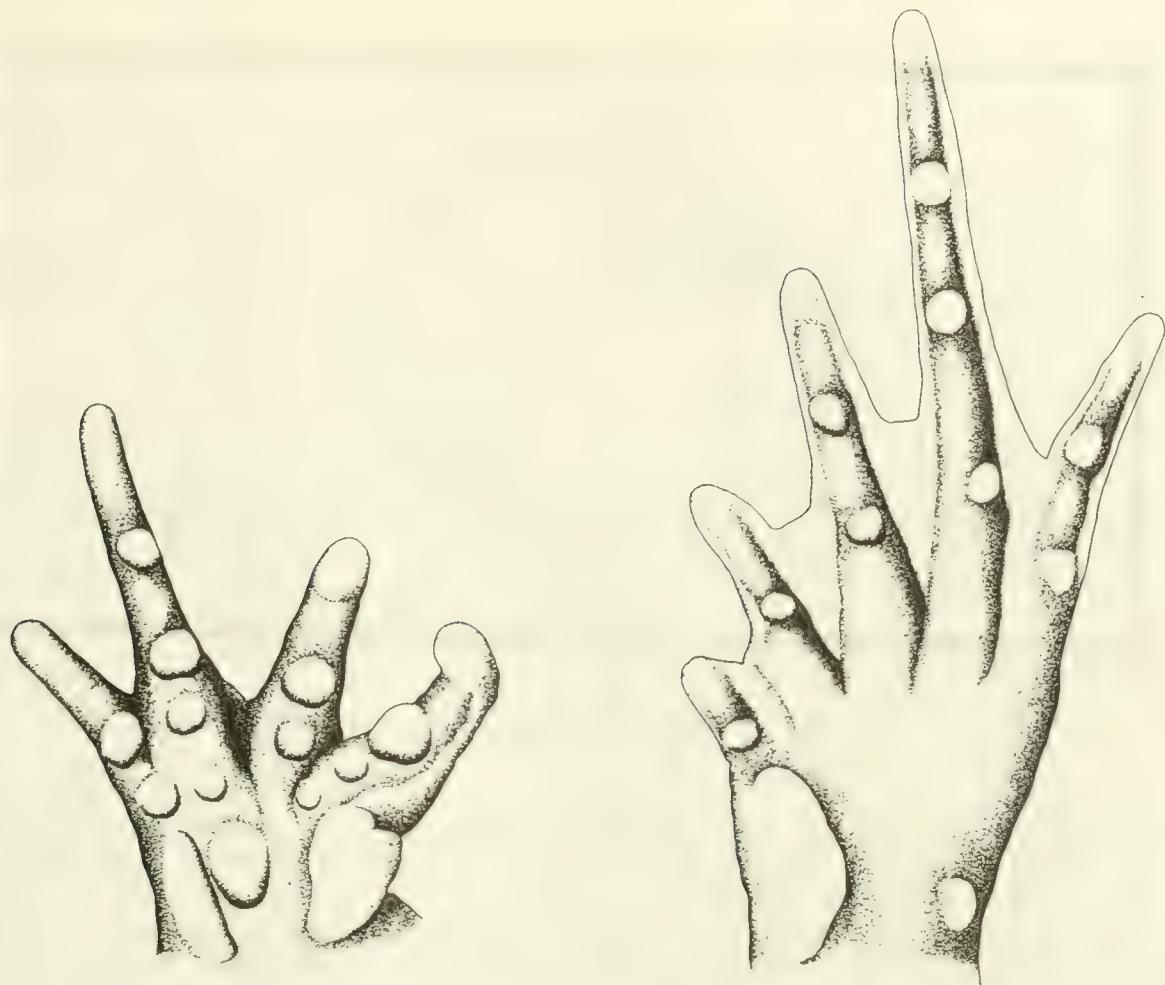


Fig. 31. Palmar view of hand (left) and plantar view of feet (right) of *Tomopterna cryptotis* (BM 1975.2445).

#### Description

Body plump. Head wide and round snout. Dorsum and flanks covered with small round warts. Belly smooth. Snout short with nostrils nearly at its tip and well separated. Tympanum generally indistinct, in some individuals visible and measures half the diameter of the eye. Fingers without webs and reduced webbing between the toes. Subarticular tubercles single and conspicuous. Three palmar tubercles. Small external metatarsal tubercle, larger than toe nearest to it.

Colour variable, from grey to olivaceous brown. Dark patch between eyes and three longitudinal pale patches on dorsum. Coloration of young similar to adults, green dorsum with yellow vertebral stripe. Dark spot on each side of snout. Breeding males with keratinized ridges on first and second finger.

#### Variation

Unknown.

#### Ecology

Unknown for North Africa. Apparently, they spend the day buried in ground and comes out on damp or rainy nights. When disturbed, they inflate their body.

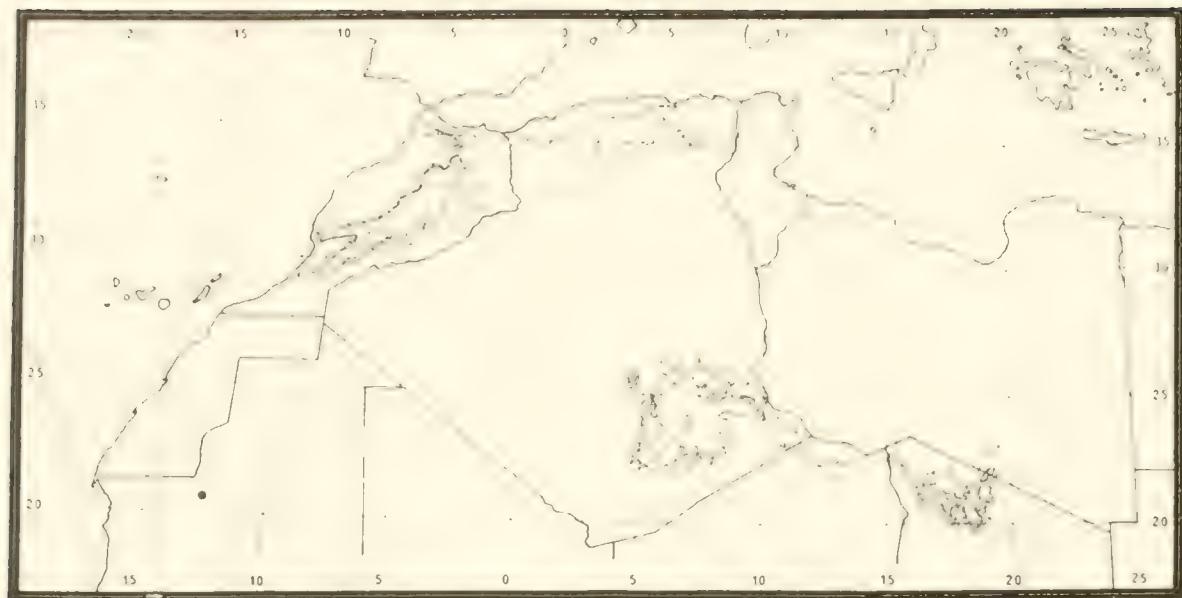


Fig. 32. Distribution of *Tomopterna cryptotis*.

#### Biology

Unknown for North Africa. They call at night during the breeding season, which in South Africa lasts from October to May. The calling males congregate in shallow pools. Eggs diameter measure 1.5 mm, and the capsule that envelops it is 3 mm. The tadpoles hatch after three days and hide in the mud. They reach a size of 39 mm total length. Metamorphosis takes place at five weeks at a size of some 12 mm SVL.

#### Distribution

Ethiopian species, in the Sahara confined to the mountains of Adrar (Mauritania) and Air (Niger) (Fig. 32).

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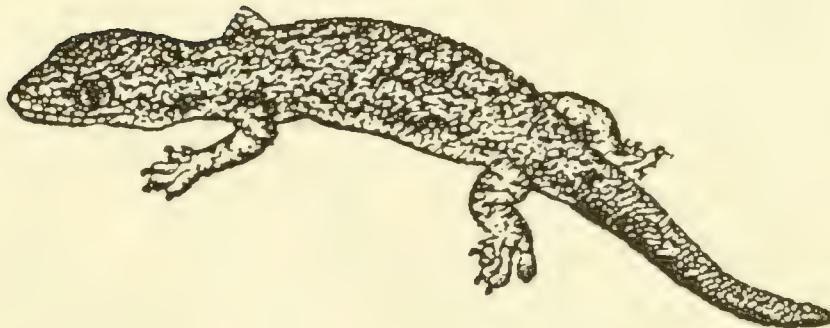






THREE NEW SUBSPECIES OF  
*HEMIPHYLLODACTYLUS YUNNANENSIS* (BOULENGER)  
FROM CHINA (LACERTIFORMES: GEKKONIDAE)

Kai-ya Zhou, Yue-zhen Liu, and Guang-ping Yang  
In: *Acta Zootaxonomica Sinica* 6(2):202-209, pl. 1 [Apr. 1981]



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TRANSLATOR'S NOTES

In preparing the English version from the original (in Chinese, with English summary), I attempted to make as literal a translation as possible. However, a few minor changes and/or explanations were necessary (marked with an asterisk and number); these remarks are in the endnotes following the references.

I thank T. Hikida, Y. Shibata, and M. Ota for their assistance during the process of preparation of the present manuscript.

## INTRODUCTION

From 1975 to 1979, we obtained a total of 640 specimens of *Hemiphyllodactylus yunnanensis* (Boulenger) that had been collected from nine localities within Yunnan Province and two localities within Guizhou Province. This paper reports the three new subspecies discovered during the sorting process of this collection. All type specimens are deposited in the Department of Biology, Nanjing Normal College.

### *Hemiphyllodactylus yunnanensis yunnanensis* (Boulenger) (Plate I:1)

The following definition is based on a total of 249<sup>\*1</sup> specimens collected from Kunming, Lijiang, Chuxiong, Chengjiang, Gejiu, and Yao'an. Chin shields distinct; hindlimb longer than half of axilla-groin distance; dilated portions of digits bearing paired scanners, digits II-V usually with 3-4-4-3 or 3-4-4-4 pairs in hand, 3-4-4-4 pairs in foot<sup>\*2</sup>, fourth pairs on digits III-V of hand not reaching outer margins of the digits (Fig. 1); diameter of ear opening 0.5-1.0 mm, about 20-43% of eye diameter.

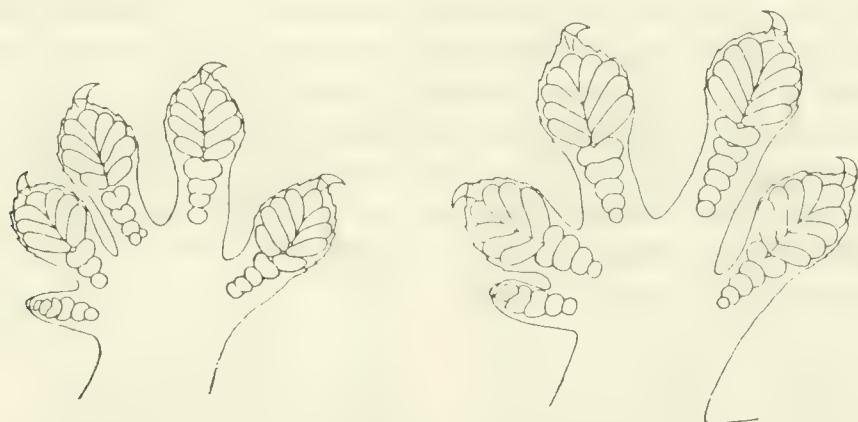


Fig. 1. Hand (left) and foot (right) of *Hemiphyllodactylus yunnanensis yunnanensis*.

Except for Yao'an sample, upper margin of rostral mostly notched, and scales posterior to supranasal usually not much enlarged (Fig. 2, Table 1).

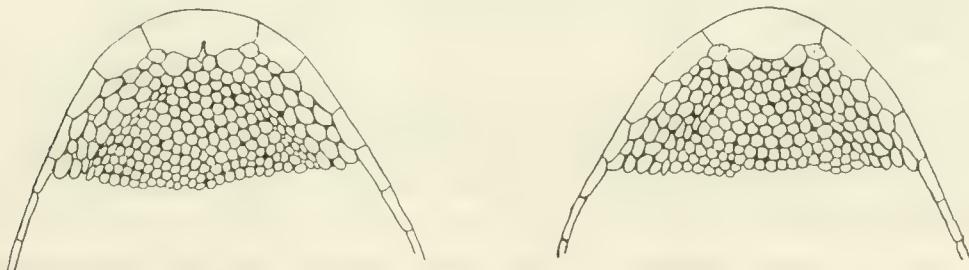


Fig. 2. Dorsal view of snouts of *Hemiphyllodactylus yunnanensis yunnanensis* from Kunming (left) and Yao'an (right).

Table 1. Scale variation on the dorsal surface of the snout in *Hemiphyllodactylus yunnanensis yunnanensis*

Localities	Notch on the upper margin of rostral				Distinctly enlarged scale posterior to supranasal			
	Present		Absent		Present		Absent	
	n	%	n	%	n	%	n	%
Yao'an	15	27.3	40	72.7	44	80.0	11	20.0
Kunming	34	100.0	0	0	2	5.9	32	94.1
Lijiang	93	98.9	1	1.1	25	26.6	69	73.4
Chuxiong	39	97.5	1	2.5	0	0	40	100.0
Gejiu	25	100.0	0	0	1	4.0	24	96.0
Chengjiang	1	100.0	0	0	0	0	1	100.0

*Hemiphyllodactylus yunnanensis longlingensis* Zhou et Liu, new subspecies  
(Plate I:2)

**Holotype:** Male (No.79003) collected from around Longling Junior High School in Longling County, Yunnan Province (alt. 1530 m), in August 1979. **Allotype:** Female (No.79066), sampling locality and date same as holotype. **Paratypes:** 32 males and 47 females, sampling locality same as holotype, collected in August 1979.

**Diagnosis -** Numbers of scansor pairs on dilated portions of digits II-V usually 3-3-3-3 in hand, 3-4-4-4 in foot\*, fourth pairs on digits III-V of foot not reaching outer margins of the digits (Fig. 3); diameter of ear opening 0.7-1.0 mm, about 26-48% of eye diameter. The number of subdigital scanners of this subspecies are smallest among those of the currently recognized subspecies of *H. yunnanensis*.

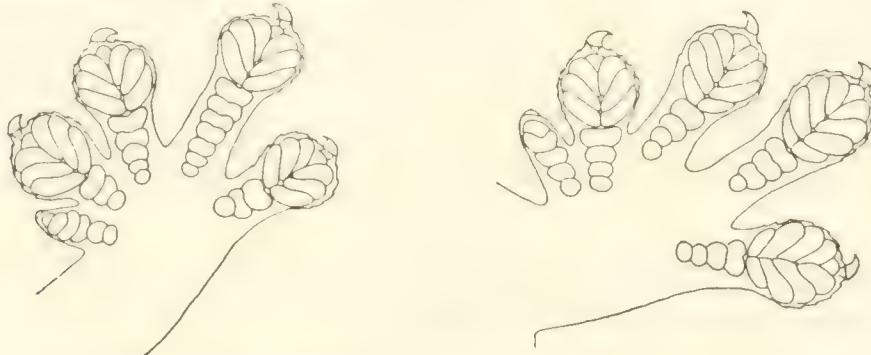


Fig. 3. Hand (left) and foot (right) of *Hemiphyllodactylus yunnanensis longlingensis*.

**Description -** Snout about 1.5-2.1 times as long as eye diameter, slightly longer than distance between eye and ear opening; head and body longer than tail, its length about 1.1-1.4 times as great as length of tail; hindlimb length 58-73% of axilla-groin distance. Measurements are given in Table 2.

Table 2. Measurements (in mm) of *Hemiphyllodactylus yunnanensis longlingensis*.

	Total length	Ear opening	Snout-anterior margin of eye	Snout-posterior margin of ear opening	Axilla-groin distance	Forelimb length	Hindlimb length
Holotype No. 79003	74.5 (41.5 + 33)	0.7	4	9	22.5	11.5	16.0
19 males	66(37+29)- 77.5(40.5+37)	0.7-1	4-5	8-9.5	18.5-22.5	10-12	13-16.0
19 females	73(39+34)- 83(46-37)	0.7-1	4-5	9-10.0	20.0-23.5	10-12	13-16.5

Rostral wider than high, upper margin mostly shallowly notched medially; supralabials 7-10, infralabials 8-11; chin shields arranged in arc, medial pair largest, followed by one smaller scale, 0.5-0.9 mm in diameter (Fig. 4), this scale lacking in a few specimens; male with 13-28 preanal-femoral pores.

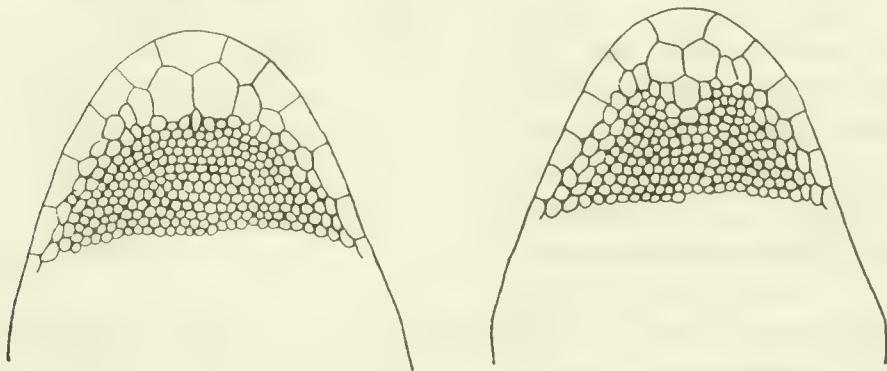


Fig. 4. Chin shields of *Hemiphyllodactylus yunnanensis yunnanensis* (left) and *H. y. longlingensis* (right).

Dorsal ground color of preserved specimen gray or brownish gray; dark brown marking running from tip of snout through eye and ear opening to shoulder; each side of dorsum with two transverse rows of dark spots, one just aside of middorsal region and the other on flank; spots of neighboring rows occasionally fused to each other, forming short dark wavy markings; darkness of such spots and frequency of their fusion highly variable, making dorsal pattern highly variable as well, such as those consisting of longitudinal rows of dark spots, a row of transverse wavy bands, dark reticulations, and indistinct markings only; dorsal surface of base of tail with one U-shaped white marking; dorsal surface of tail with transverse dark brown bands, or a transverse row of large black spots; venter of body flesh color or gray; venter of tail reddish orange (50% of males and 60% of females) or light gray.

**Ecological data -** All adult females collected from Longling from the middle to late August had already oviposited and possessed only ovarian follicles, 1.7-1.8 mm in diameter. The testes of adult males measured about 3.5×7 mm. Of the adult females collected from Changyuan in May, however, about half possessed eggs, 6×8 - 6×8.5 mm in size, at the upper end of oviducts, whereas the remainder had already oviposited, and possessed only

ovarian follicles, about 2 mm in diameter. The adult males of this sample series had testes of about  $3.5 \times 6.3$  mm.

About one fifth of the specimens from Longling had ticks on the ventral surface of the body and limbs, but the ticks were few on the dorsal surface. As to the specimens from Changyuan, about one seventh bore ticks on the ventral surface of the body and limbs, as well as around the orbits.

**Distribution** - This subspecies also occurs in Changyuan of the Yunnan Province.

*Hemiphyllodactylus yunnanensis jinpingensis* Zhou et Liu, new subspecies  
(Plate I:3)

**Holotype:** Male (No. 78849) collected from around Jinping First Junior High School in Jinping County, Yunnan Province (alt. 1260 m), in July 1978. **Allotype:** Female (No. 78844), sampling locality and date same as holotype. **Paratypes:** 19 males and 21 females, sampling locality same as holotype, collected in July 1978.

**Diagnosis** - Numbers of scisor pairs on dilated portions of digits II-V usually 3-4-4-4 in hand, 4-5-5-5 in foot<sup>\*2</sup>, fifth pairs on digits III-V of foot not reaching outer margins of digits (Fig. 5); diameter of ear opening 0.5-0.7 mm, about 19-27% of eye diameter. The number of subdigital scisors of this subspecies is greater than those of *H. y. longlingensis* and the nominotypical subspecies. From *H. y. dushanensis*, *H. y. jinpingensis* differs in having relatively small fifth scisor pairs on digits III-V, which do not reach outer margins of digits.

**Description** - Snout about 1.7-2 times as long as eye diameter, longer than distance between eye and ear opening; head and body as long as, or longer than tail, its length about 1-1.39 times as great as length of tail; hindlimb length 60-76% of axilla-groin distance. Measurements are given in Table 3.

Rostral wider than high, upper margin notched medially; supralabials 8-10, infralabials 9-11; chin shields arranged in arc, medial pair enlarged, usually followed by a row of slightly enlarged scales; male with 24-31 preanal-femoral pores.

Color of preserved specimen brownish gray; one indistinct dark marking running from tip of snout through eye and upper margin of ear opening to shoulder; dorsal surface of body with some 10 transverse dark wavy bands; dorsal surface of base of tail with one U-shaped white marking; dorsal surface of tail with about 10 transverse dark bands.

**Ecological data** - More than half of the adult females collected at Jinping from the middle

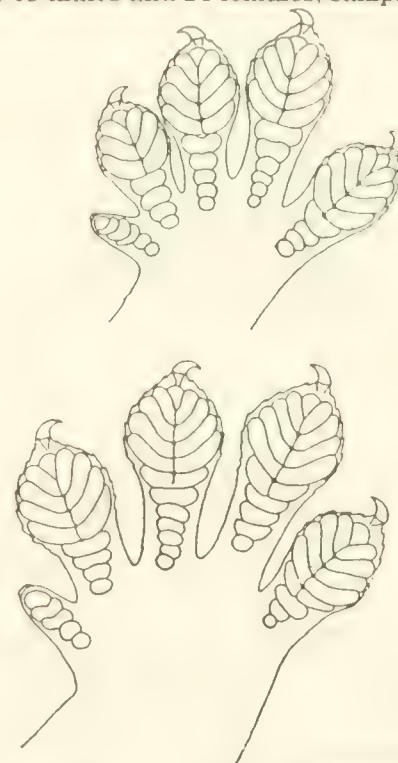


Fig. 5. Hand (left) and foot (right) of *Hemiphyllodactylus yunnanensis jinpingensis*.

to late July had eggs,  $4.5 \times 5.1 - 5 \times 8$  mm in size, at the upper end of oviducts. The testes of the adult males measured about  $3.5 \times 5.5$  mm. Sixty-five percent of the adult females collected at Xingyi in Guizhou Province during June and July by the Chengdu Institute of Biology, Academia Sinica, had eggs.

About one fourth of the specimens collected at Jinping had ticks on the ventral surface of the body and limbs.

**Distribution** - Judging from the specimens deposited in our department and Chengdu Institute of Biology, Academia Sinica, this subspecies also occurs in Xingyi, Anlong and Huishui of Guizhou Province, and Dayaoshan of Guangxi Province. The populations of *H. yunnanensis* in Guangxi and Guizhou Provinces, reported by Liu and Hu (1962) and Hu *et al.* (1973), belong to this subspecies.

Table 3. Measurements (in mm) of *Hemiphyllodactylus yunnanensis jinpingensis*.

	Total length	Ear opening	Snout-anterior margin of eye	Snout-posterior margin of ear opening	Axilla-groin distance	Forelimb length	Hindlimb length
Holotype No. 78849	86.5 (44.5 + 42)	0.6	4.5	10.0	21.5	11.0	15.5
10 males	69(37+32)-92(46+46)	0.5-0.6	4.0-5	9.0-10.5	18.0-23.5	10-11.5	13-16.0
10 females	85.5(49+36.5)-96.5(53.5+43)	0.5-0.7	4.5-5	10.5-11.0	24.0-28.5	11-12.0	16-17.5

#### *Hemiphyllodactylus yunnanensis dushanensis* Zhou *et* Liu, new subspecies (Plate I:4)

**Holotype:** Male (No.78999) collected from around Dushan Junior Highschool in Dushan County, Guizhou Province (alt. 970 m), in June 1978. **Allotype:** Female (No.78984), sampling locality and date same as holotype. **Paratypes:** 28 males and 31 females, sampling locality same as holotype, collected in June 1978.

**Diagnosis** - Numbers of scansor pairs on dilated portions of digits II-V usually 3-4-4-4 in hand, 4-5-5-5 in foot\*, fifth pairs on digits III-V of foot relatively large compared to *H. y. jinpingensis*, extending to outer margin of digits in most specimens (Fig. 6); diameter of ear opening 0.3-0.6 mm, about 13-25% of eye diameter; dorsal surface without pattern, or with only a few irregular dark markings.



Fig. 6. Hand (left) and foot (right) of *Hemiphyllodactylus yunnanensis dushanensis*.

**Description** - Snout about 1.4-2.2 times as long as eye diameter, slightly longer than distance between eye and ear opening; head and body longer than tail, its length about 1.06-1.28 times as great as length of tail; hindlimb length 61-77% of axilla-groin distance. Measurements are given in Table 4.

Table 4. Measurements (in mm) of *Hemiphyllodactylus yunnanensis dushanensis*.

	Total length	Ear opening	Snout-anterior margin of eye	Snout-posterior margin of ear opening <sup>a,b</sup>	Axilla-groin distance	Forelimb length	Hindlimb length
Holotype No. 78999	80 (44+36)	0.5	4.5	10	22.0	11.0	15.5
9 males	80(44+36)- 89(46+43)	0.4-0.6	4-5.0	9-10	22-25.5	10.5-11	15-17.0
10 females	87(48+39)- 96(51+45)	0.3-0.6	5-5.5	10-11	25-27.0	11.0-12	16-17.5

Rostral wider than high, upper margin notched medially; supralabials 9-12, infralabials 8-12; chin shields arranged in arc, medial pair enlarged, followed by a row of slightly enlarged scales; male with 22-29 preanal-femoral pores.

Color of preserved specimen brownish gray; one indistinct dark marking running from tip of snout through eye and upper margin of ear opening to shoulder; dorsal surface of body without dark pattern, or with a few indistinct dark irregular markings; dorsal surface of tail usually without distinct pattern, but more than 10 transverse dark bands in a few specimens.

**Ecological data** - More than half of the adult females collected at Dushan of Guizhou in June had eggs,  $6.2 \times 8.7$  -  $6.8 \times 9.2$  mm in size, at the upper end of oviducts. The testes of adult males measured about  $3.5 \times 5.5$  mm.

About one fifth of the specimens from Dushan had ticks on the ventral surface of the body and limbs.



Fig. 7. Map showing the distribution of each subspecies of *Hemiphyllodactylus yunnanensis* in China. The solid circles, solid rectangles, dot in circles, and the solid triangle represent locality records of *H. y. yunnanensis*, *H. y. longlingensis*, *H. y. jinpingensis*, and *H. y. dushanensis*, respectively<sup>a</sup>.

The distributions of the subspecies of *H. yunnanensis* in China are shown in Fig. 7.

Key to subspecies of *H. yunnanensis* in China

- 1(2) Number of scansor pairs on dilated portions of digits II-V of hand 3-3-3-3-----  
----- *H. y. longlingensis* Zhou et Liu, new subspecies
- 2(1) Number of scansor pairs on dilated portions of digits II-V of hand 3-4-4-3 or 3-4-4-4
- 3(4) Number of scansor pairs on dilated portions of digits II-V of foot 3-4-4-4-----  
----- *H. y. yunnanensis* (Boulenger)
- 4(3) Number of scansor pairs on dilated portions of digits II-V of foot 4-5-5-5
- 5(6) Fifth pairs of scanners on digits III-V of foot not extending to outer margin of digits-----  
----- *H. y. jinpingensis* Zhou et Liu, new subspecies
- 6(5) Fifth pairs of scanners on digits III-V of foot usually reaching outer margin of digits-----  
----- *H. y. dushanensis* Zhou et Liu, new subspecies

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     Xantusiidae. Das Tierreich 80. Walter de Gruyter & Co., Berlin.

## TRANSLATOR'S ENDNOTES

- 1 In the original, the total number of specimens of *H. y. yunnanensis* examined is printed as 349. However, judging from the sum of local samples given in Table 1, it seems likely that the number is actually 249.
- 2 In the original, the number of scisor pairs on the dilated portions of digits are abbreviated, without explanations, as 3443-3444/3444 for *H. y. yunnanensis*, 3333/3444 for *H. y. longlingensis*, 3444/4555 for *H. y. jimpingensis*, and 3444/4555 for *H. y. dushanensis*. The explanations added to this translation are based on information provided in the corresponding figures and the key.
- 3 In the original, this column is headed as "Snout to posterior margin of eye". However, judging from values given therein as well as consistency with the format of other tables, this label must be corrected to the posterior margin of ear.
- 4 The locality names have been added to the map by the translator.
- 5 Of the publications listed below, only Hu *et al.* (1973) and Liu and Hu (1962) were directly cited in the text. The others may have been listed as the background for the present study.

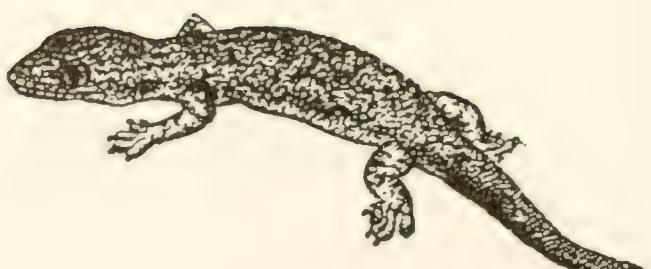
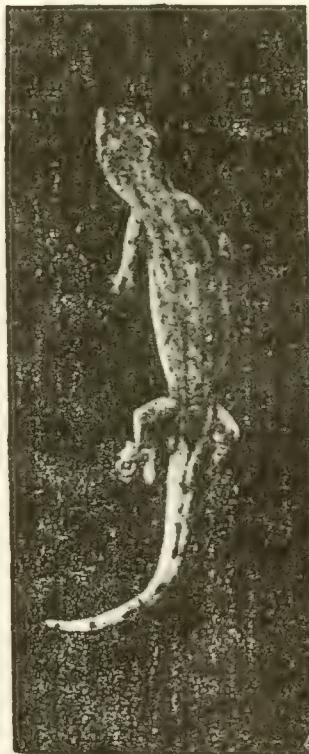
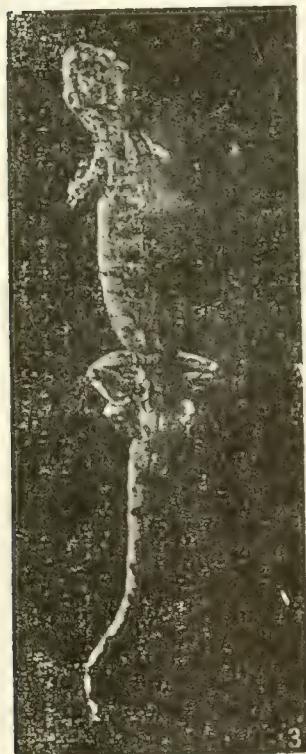
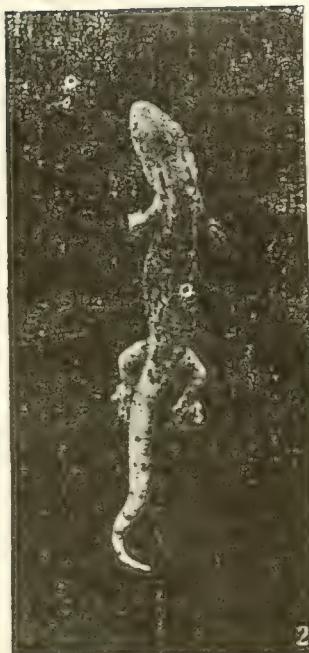
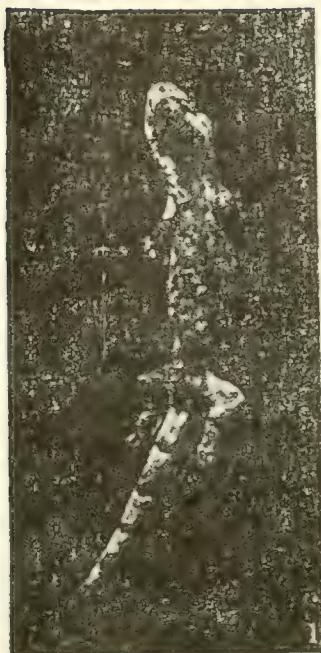


Plate I.



1. *Hemiphyllodactylus yunnanensis yunnanensis* (Boulenger).
2. *H. y. longlingensis* Zhou et Liu, new species.
3. *H. y. jinpingensis* Zhou et Liu, new species.
4. *H. y. dushanensis* Zhou et Liu, new species.



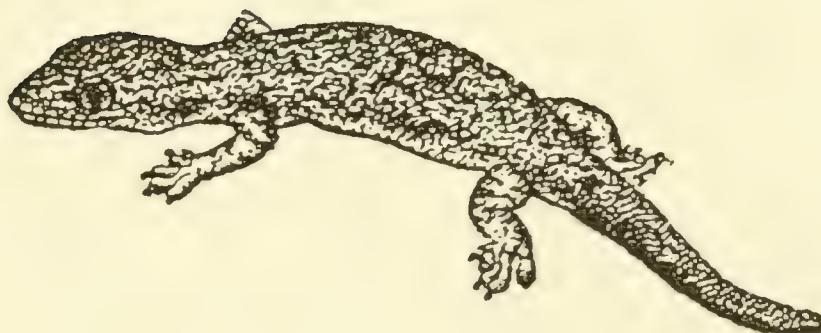




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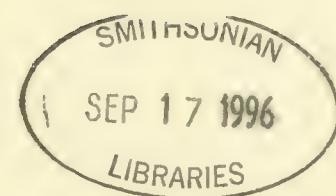
THREE NEW SUBSPECIES OF  
*HEMIPHYLLODACTYLUS YUNNANENSIS* (BOULENGER)  
FROM CHINA (LACERTIFORMES: GEKKONIDAE)

Kai-ya Zhou, Yue-zhen Liu, and Guang-ping Yang  
In: *Acta Zootaxonomica Sinica* 6(2):202-209, pl. 1 [Apr. 1981]



Translated by

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TRANSLATOR'S NOTES

In preparing the English version from the original (in Chinese, with English summary), I attempted to make as literal a translation as possible. However, a few minor changes and/or explanations were necessary (marked with an asterisk and number); these remarks are in the endnotes following the references.

I thank T. Hikida, Y. Shibata, and M. Ota for their assistance during the process of preparation of the present manuscript.

## INTRODUCTION

From 1975 to 1979, we obtained a total of 640 specimens of *Hemiphyllodactylus yunnanensis* (Boulenger) that had been collected from nine localities within Yunnan Province and two localities within Guizhou Province. This paper reports the three new subspecies discovered during the sorting process of this collection. All type specimens are deposited in the Department of Biology, Nanjing Normal College.

### *Hemiphyllodactylus yunnanensis yunnanensis* (Boulenger) (Plate I:1)

The following definition is based on a total of 249<sup>1</sup> specimens collected from Kunming, Lijiang, Chuxiong, Chengjiang, Gejiu, and Yao'an. Chin shields distinct; hindlimb longer than half of axilla-groin distance; dilated portions of digits bearing paired scansors, digits II-V usually with 3-4-4-3 or 3-4-4-4 pairs in hand, 3-4-4-4 pairs in foot<sup>\*2</sup>, fourth pairs on digits III-V of hand not reaching outer margins of the digits (Fig. 1); diameter of ear opening 0.5-1.0 mm, about 20-43% of eye diameter.



Fig. 1. Hand (left) and foot (right) of *Hemiphyllodactylus yunnanensis yunnanensis*.

Except for Yao'an sample, upper margin of rostral mostly notched, and scales posterior to supranasal usually not much enlarged (Fig. 2, Table 1).

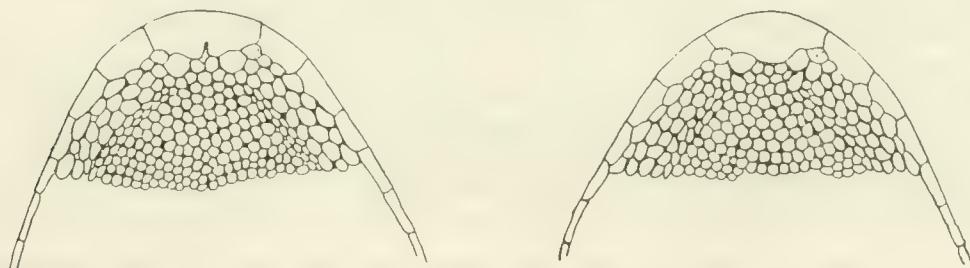


Fig. 2. Dorsal view of snouts of *Hemiphyllodactylus yunnanensis yunnanensis* from Kunming (left) and Yao'an (right).

Table 1. Scale variation on the dorsal surface of the snout in *Hemiphyllodactylus yunnanensis yunnanensis*

Localities	Notch on the upper margin of rostral				Distinctly enlarged scale posterior to supranasal			
	Present		Absent		Present		Absent	
	n	%	n	%	n	%	n	%
Yao'an	15	27.3	40	72.7	44	80.0	11	20.0
Kunming	34	100.0	0	0	2	5.9	32	94.1
Lijiang	93	98.9	1	1.1	25	26.6	69	73.4
Chuxiong	39	97.5	1	2.5	0	0	40	100.0
Gejiu	25	100.0	0	0	1	4.0	24	96.0
Chengjiang	1	100.0	0	0	0	0	1	100.0

*Hemiphyllodactylus yunnanensis longlingensis* Zhou et Liu, new subspecies  
(Plate I:2)

Holotype: Male (No.79003) collected from around Longling Junior High School in Longling County, Yunnan Province (alt. 1530 m), in August 1979. Allotype: Female (No.79066), sampling locality and date same as holotype. Paratypes: 32 males and 47 females, sampling locality same as holotype, collected in August 1979.

Diagnosis - Numbers of scansor pairs on dilated portions of digits II-V usually 3-3-3-3 in hand, 3-4-4-4 in foot\*, fourth pairs on digits III-V of foot not reaching outer margins of the digits (Fig. 3); diameter of ear opening 0.7-1.0 mm, about 26-48% of eye diameter. The number of subdigital scanners of this subspecies are smallest among those of the currently recognized subspecies of *H. yunnanensis*.

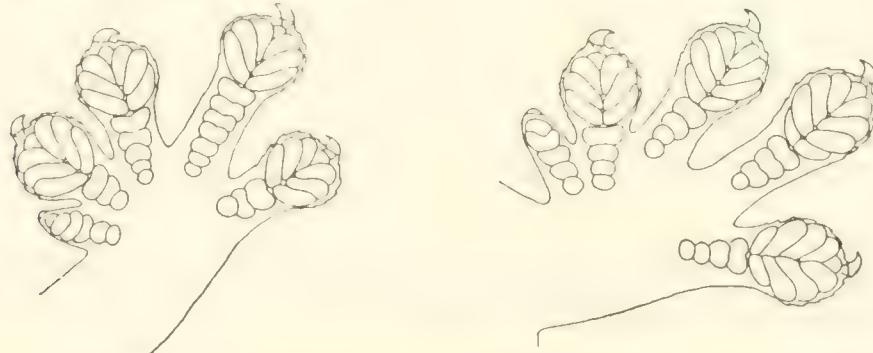


Fig. 3. Hand (left) and foot (right) of *Hemiphyllodactylus yunnanensis longlingensis*.

Description - Snout about 1.5-2.1 times as long as eye diameter, slightly longer than distance between eye and ear opening; head and body longer than tail, its length about 1.1-1.4 times as great as length of tail; hindlimb length 58-73% of axilla-groin distance. Measurements are given in Table 2.

Table 2. Measurements (in mm) of *Hemiphyllodactylus yunnanensis longlingensis*.

	Total length	Ear opening	Snout-anterior margin of eye	Snout-posterior margin of ear opening	Axilla-groin distance	Forelimb length	Hindlimb length
Holotype No. 79003	74.5 (41.5 + 33)	0.7	4	9	22.5	11.5	16.0
19 males	66(37+29)- 77.5(40.5+37)	0.7-1	4-5	8-9.5	18.5-22.5	10-12	13-16.0
19 females	73(39+34)- 83(46-37)	0.7-1	4-5	9-10.0	20.0-23.5	10-12	13-16.5

Rostral wider than high, upper margin mostly shallowly notched medially; supralabials 7-10, infralabials 8-11; chin shields arranged in arc, medial pair largest, followed by one smaller scale, 0.5-0.9 mm in diameter (Fig. 4), this scale lacking in a few specimens; male with 13-28 preanal-femoral pores.

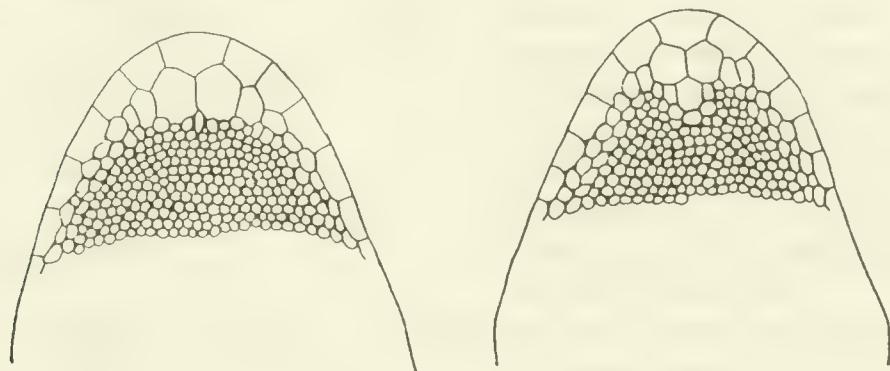


Fig. 4. Chin shields of *Hemiphyllodactylus yunnanensis* (left) and *H. y. longlingensis* (right).

Dorsal ground color of preserved specimen gray or brownish gray; dark brown marking running from tip of snout through eye and ear opening to shoulder; each side of dorsum with two transverse rows of dark spots, one just aside of middorsal region and the other on flank; spots of neighboring rows occasionally fused to each other, forming short dark wavy markings; darkness of such spots and frequency of their fusion highly variable, making dorsal pattern highly variable as well, such as those consisting of longitudinal rows of dark spots, a row of transverse wavy bands, dark reticulations, and indistinct markings only; dorsal surface of base of tail with one U-shaped white marking; dorsal surface of tail with transverse dark brown bands, or a transverse row of large black spots; venter of body flesh color or gray; venter of tail reddish orange (50% of males and 60% of females) or light gray.

**Ecological data -** All adult females collected from Longling from the middle to late August had already oviposited and possessed only ovarian follicles, 1.7-1.8 mm in diameter. The testes of adult males measured about 3.5×7 mm. Of the adult females collected from Changyuan in May, however, about half possessed eggs, 6×8 - 6×8.5 mm in size, at the upper end of oviducts, whereas the remainder had already oviposited, and possessed only

ovarian follicles, about 2 mm in diameter. The adult males of this sample series had testes of about  $3.5 \times 6.3$  mm.

About one fifth of the specimens from Longling had ticks on the ventral surface of the body and limbs, but the ticks were few on the dorsal surface. As to the specimens from Changyuan, about one seventh bore ticks on the ventral surface of the body and limbs, as well as around the orbits.

**Distribution** - This subspecies also occurs in Changyuan of the Yunnan Province.

*Hemiphyllodactylus yunnanensis jinpingensis* Zhou et Liu, new subspecies  
(Plate I:3)

**Holotype:** Male (No. 78849) collected from around Jinping First Junior High School in Jinping County, Yunnan Province (alt. 1260 m), in July 1978. **Allotype:** Female (No. 78844), sampling locality and date same as holotype. **Paratypes:** 19 males and 21 females, sampling locality same as holotype, collected in July 1978.

**Diagnosis** - Numbers of scansor pairs on dilated portions of digits II-V usually 3-4-4-4 in hand, 4-5-5-5 in foot\*, fifth pairs on digits III-V of foot not reaching outer margins of digits (Fig. 5); diameter of ear opening 0.5-0.7 mm, about 19-27% of eye diameter. The number of subdigital scansors of this subspecies is greater than those of *H. y. longlingensis* and the nominotypical subspecies. From *H. y. dushanensis*, *H. y. jinpingensis* differs in having relatively small fifth scansor pairs on digits III-V, which do not reach outer margins of digits.

**Description** - Snout about 1.7-2 times as long as eye diameter, longer than distance between eye and ear opening; head and body as long as, or longer than tail, its length about 1-1.39 times as great as length of tail; hindlimb length 60-76% of axilla-groin distance. Measurements are given in Table 3.

Rostral wider than high, upper margin notched medially; supralabials 8-10, infralabials 9-11; chin shields arranged in arc, medial pair enlarged, usually followed by a row of slightly enlarged scales; male with 24-31 preanal-femoral pores.

Color of preserved specimen brownish gray; one indistinct dark marking running from tip of snout through eye and upper margin of ear opening to shoulder; dorsal surface of body with some 10 transverse dark wavy bands; dorsal surface of base of tail with one U-shaped white marking; dorsal surface of tail with about 10 transverse dark bands.

**Ecological data** - More than half of the adult females collected at Jinping from the middle

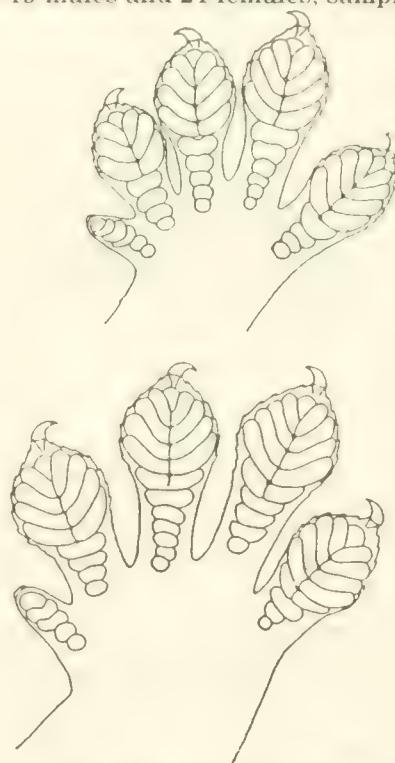


Fig. 5. Hand (left) and foot (right) of *Hemiphyllodactylus yunnanensis jinpingensis*.

to late July had eggs,  $4.5 \times 5.1 - 5 \times 8$  mm in size, at the upper end of oviducts. The testes of the adult males measured about  $3.5 \times 5.5$  mm. Sixty-five percent of the adult females collected at Xingyi in Guizhou Province during June and July by the Chengdu Institute of Biology, Academia Sinica, had eggs.

About one fourth of the specimens collected at Jinping had ticks on the ventral surface of the body and limbs.

**Distribution** - Judging from the specimens deposited in our department and Chengdu Institute of Biology, Academia Sinica, this subspecies also occurs in Xingyi, Anlong and Huishui of Guizhou Province, and Dayaoshan of Guangxi Province. The populations of *H. yunnanensis* in Guangxi and Guizhou Provinces, reported by Liu and Hu (1962) and Hu *et al.* (1973), belong to this subspecies.

Table 3. Measurements (in mm) of *Hemiphyllodactylus yunnanensis jinpingensis*.

	Total length	Ear opening	Snout-anterior margin of eye	Snout-posterior margin of ear opening	Axilla-groin distance	Forelimb length	Hindlimb length
Holotype No.78849	86.5 (44.5 + 42)	0.6	4.5	10.0	21.5	11.0	15.5
10 males	69(37+32)-92(46+46)	0.5-0.6	4.0-5	9.0-10.5	18.0-23.5	10-11.5	13-16.0
10 females	85.5(49+36.5)-96.5(53.5+43)	0.5-0.7	4.5-5	10.5-11.0	24.0-28.5	11-12.0	16-17.5

#### *Hemiphyllodactylus yunnanensis dushanensis* Zhou *et* Liu, new subspecies (Plate I:4)

**Holotype:** Male (No.78999) collected from around Dushan Junior Highschool in Dushan County, Guizhou Province (alt. 970 m), in June 1978. **Allotype:** Female (No.78984), sampling locality and date same as holotype. **Paratypes:** 28 males and 31 females, sampling locality same as holotype, collected in June 1978.

**Diagnosis** - Numbers of scansor pairs on dilated portions of digits II-V usually 3-4-4-4 in hand, 4-5-5-5 in foot<sup>\*2</sup>, fifth pairs on digits III-V of foot relatively large compared to *H. y. jinpingensis*, extending to outer margin of digits in most specimens (Fig. 6); diameter of ear opening 0.3-0.6 mm, about 13-25% of eye diameter; dorsal surface without pattern, or with only a few irregular dark markings.

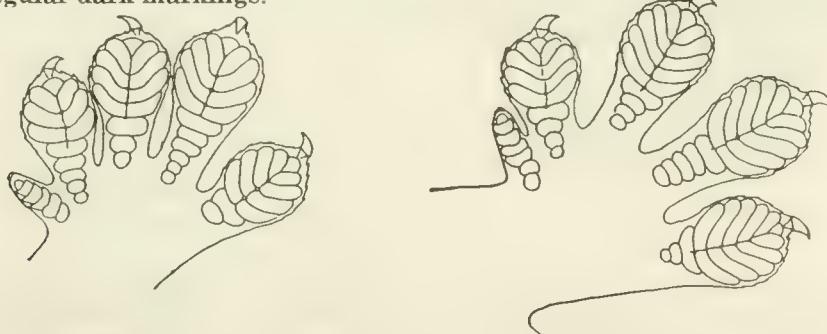


Fig. 6. Hand (left) and foot (right) of *Hemiphyllodactylus yunnanensis dushanensis*.

**Description** - Snout about 1.4-2.2 times as long as eye diameter, slightly longer than distance between eye and ear opening; head and body longer than tail, its length about 1.06-1.28 times as great as length of tail; hindlimb length 61-77% of axilla-groin distance. Measurements are given in Table 4.

Table 4. Measurements (in mm) of *Hemiphyllodactylus yunnanensis dushanensis*.

	Total length	Ear opening	Snout-anterior margin of eye	Snout-posterior margin of ear opening*	Axilla-groin distance	Forelimb length	Hindlimb length
Holotype No. 78999	80 (44+36)	0.5	4.5	10	22.0	11.0	15.5
9 males	80(44+36)-89(46+43)	0.4-0.6	4-5.0	9-10	22-25.5	10.5-11	15-17.0
10 females	87(48+39)-96(51+45)	0.3-0.6	5-5.5	10-11	25-27.0	11.0-12	16-17.5

Rostral wider than high, upper margin notched medially; supralabials 9-12, infralabials 8-12; chin shields arranged in arc, medial pair enlarged, followed by a row of slightly enlarged scales; male with 22-29 preanal-femoral pores.

Color of preserved specimen brownish gray; one indistinct dark marking running from tip of snout through eye and upper margin of ear opening to shoulder; dorsal surface of body without dark pattern, or with a few indistinct dark irregular markings; dorsal surface of tail usually without distinct pattern, but more than 10 transverse dark bands in a few specimens.

**Ecological data** - More than half of the adult females collected at Dushan of Guizhou in June had eggs,  $6.2 \times 8.7$  -  $6.8 \times 9.2$  mm in size, at the upper end of oviducts. The testes of adult males measured about  $3.5 \times 5.5$  mm.

About one fifth of the specimens from Dushan had ticks on the ventral surface of the body and limbs.



Fig. 7. Map showing the distribution of each subspecies of *Hemiphyllodactylus yunnanensis* in China. The solid circles, solid rectangles, dot in circles, and the solid triangle represent locality records of *H. y. yunnanensis*, *H. y. longlingensis*, *H. y. jinpingensis*, and *H. y. dushanensis*, respectively\*.

The distributions of the subspecies of *H. yunnanensis* in China are shown in Fig. 7.

**Key to subspecies of *H. yunnanensis* in China**

- 1(2) Number of scansor pairs on dilated portions of digits II-V of hand 3-3-3-3-----  
----- *H. y. longlingensis* Zhou et Liu, new subspecies
- 2(1) Number of scansor pairs on dilated portions of digits II-V of hand 3-4-4-3 or 3-4-4-4  
3(4) Number of scansor pairs on dilated portions of digits II-V of foot 3-4-4-4-----  
----- *H. y. yunnanensis* (Boulenger)
- 4(3) Number of scansor pairs on dilated portions of digits II-V of foot 4-5-5-5  
5(6) Fifth pairs of scanners on digits III-V of foot not extending to outer margin of digits----  
----- *H. y. jinpingensis* Zhou et Liu, new subspecies
- 6(5) Fifth pairs of scanners on digits III-V of foot usually reaching outer margin of digits----  
----- *H. y. dushanensis* Zhou et Liu, new subspecies

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## TRANSLATOR'S ENDNOTES

- 1 In the original, the total number of specimens of *H. y. yunnanensis* examined is printed as 349. However, judging from the sum of local samples given in Table 1, it seems likely that the number is actually 249.
- 2 In the original, the number of scensor pairs on the dilated portions of digits are abbreviated, without explanations, as 3443-3444/3444 for *H. y. yunnanensis*, 3333/3444 for *H. y. longlingensis*, 3444/4555 for *H. y. jinpingensis*, and 3444/4555 for *H. y. dushanensis*. The explanations added to this translation are based on information provided in the corresponding figures and the key.
- 3 In the original, this column is headed as "Snout to posterior margin of eye". However, judging from values given therein as well as consistency with the format of other tables, this label must be corrected to the posterior margin of ear.
- 4 The locality names have been added to the map by the translator.
- 5 Of the publications listed below, only Hu *et al.* (1973) and Liu and Hu (1962) were directly cited in the text. The others may have been listed as the background for the present study.

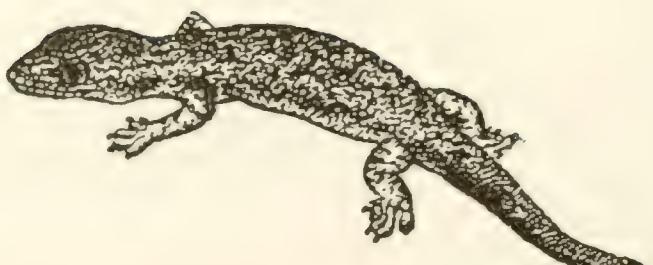
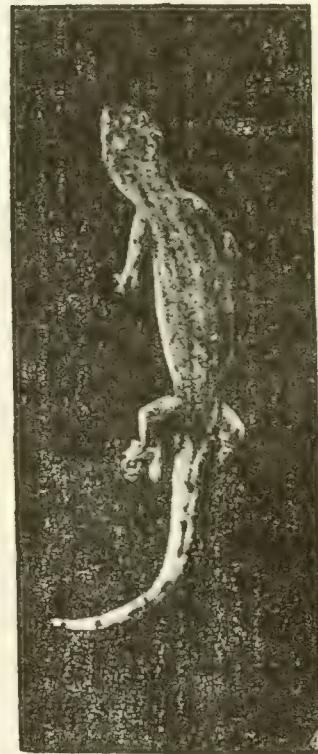
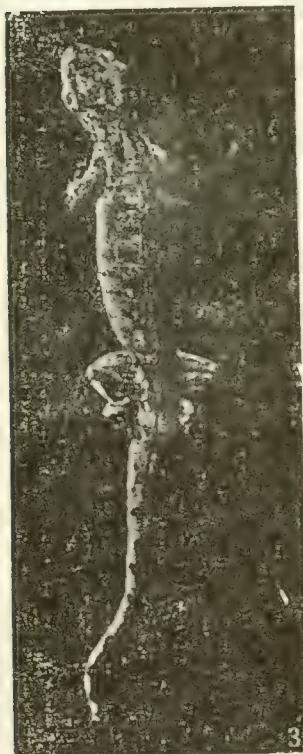
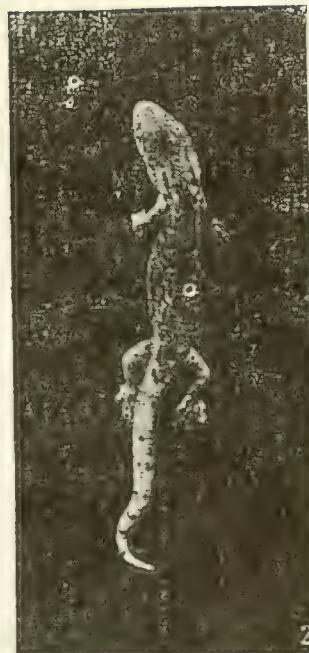
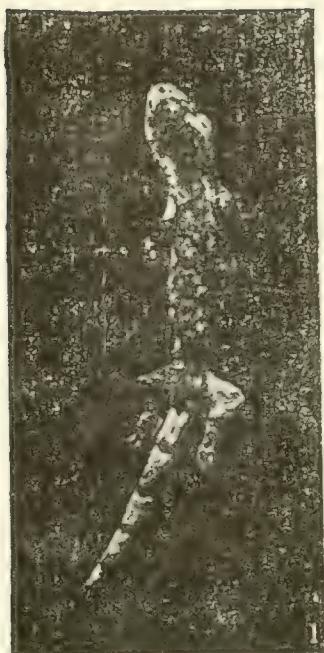


Plate I.



1. *Hemiphyllodactylus yunnanensis yunnanensis* (Boulenger).
2. *H. y. longlingensis* Zhou et Liu, new species.
3. *H. y. jinpingensis* Zhou et Liu, new species.
4. *H. y. dushanensis* Zhou et Liu, new species.

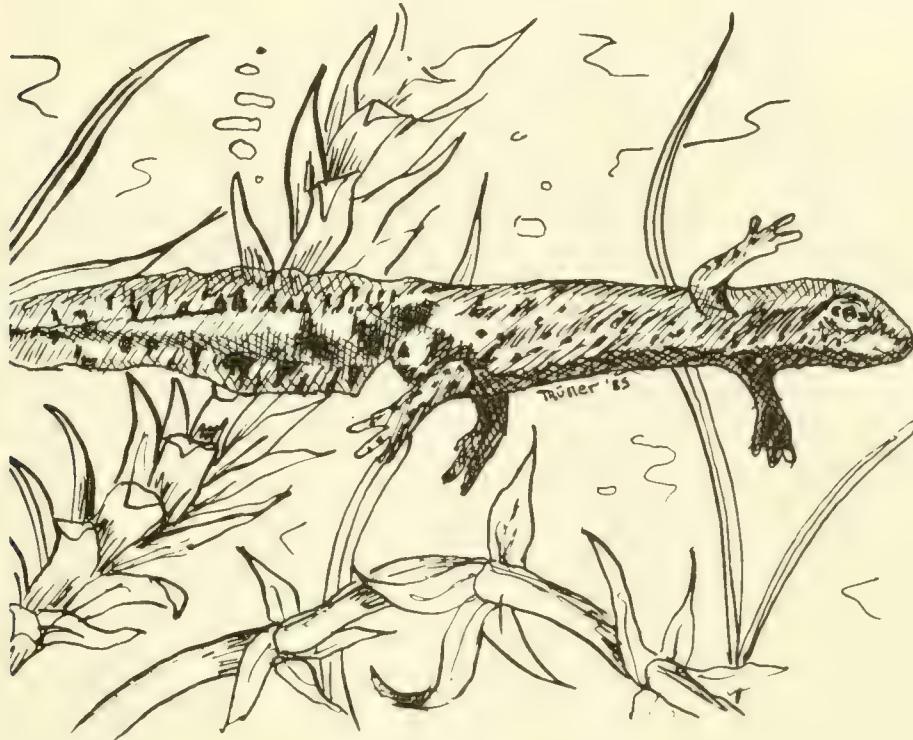




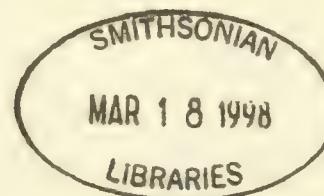


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BIBLIOGRAPHY AND INDICES TO THE  
HERPETOLOGICAL PAPERS PUBLISHED IN  
FRESHWATER BIOLOGY AND LIMNOLOGY JOURNALS  
1950-1995



Dreux J. Watermolen  
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## INTRODUCTION

Amphibians and reptiles are significant and important components of the fauna in many freshwater habitats, often comprising enormous populations and reaching significant biomass levels. For example, as many as 88,000 amphibians were captured in a single year at a 1 ha temporary pond in South Carolina (Savannah River Ecology Laboratory 1980), and freshwater turtles are known to represent the majority of vertebrate biomass in many aquatic habitats (Congdon, et al. 1986; Cogdon and Gibbons 1988).

Large numbers of amphibians dominate the higher trophic levels in some habitats. Recent studies (e.g., Schabetsberger and Jersabek 1995) suggest that amphibians are often the top predators in some aquatic systems. Amphibian populations also influence primary and secondary productivity, nutrient influx, and competition in these systems (Seale 1980; Osborne and McLachlan 1985). The potential significance of freshwater turtles as vectors of seeds and parasites among temporary aquatic habitats has also recently been suggested (Congdon and Gibbons 1988).

Because of this importance, one might expect to find a significant number of papers dealing with amphibians and reptiles appearing in freshwater biology and limnology journals. Articles from these journals are often not cited in the herpetological literature, and herpetologists sometimes overlook these journals as potential sources of herpetological information. I was curious to see how extensive this "untapped" literature is. This bibliography is the result of that curiosity and should aid herpetologists in locating several useful papers.

The table of contents of each issue of the following journals was scanned for papers dealing with amphibians or reptiles:

- Australian Journal of Marine and Freshwater Research* (Vols. 1-45, 1950-1994)
- Freshwater Biology* (Vols. 1-34, 1971-1995)
- Hydrobiologia* (Vols. 1-310, 1948-1995)
- Hydrobiological Journal* (Vols. 5-31, 1969-1995)
- Journal of Freshwater Ecology* (Vols. 1-10, 1981-1995)
- New Zealand Journal of Marine and Freshwater Research* (Vols. 1-29, 1967-1995)

In addition, each annual index for the *Canadian Journal of Fisheries and Aquatic Sciences* (Vols. 37-52, 1980-1995) was reviewed for the terms Amphibia, amphibian, frog, newt, Reptilia, reptile, salamander, tadpole, toad, turtle, as well as likely generic names such as *Ambystoma*, *Bufo*, *Chelydra*, *Chrysemys*, *Notophthalmus*, and *Rana*. Similar searches were made of the cumulative indices for *Hydrobiologia* (Vol. 76, covering Vols. 1-75; Vol. 126, covering Vols. 76-125; and Vol. 296, covering Vols. 126-250).

Only two herpetological papers, both dealing with sea turtles, were found in the *New Zealand Journal of Marine and Freshwater Research*. A single review of a book dealing with diseases of marine animals including reptiles (Lester 1987) was also found in this journal. The *Australian Journal of Marine and Freshwater Research* contained only two herpetological papers, one covering nematode parasites of the sea turtle *Caretta caretta* and one dealing with sea snakes. *Hydrobiological Journal* (the English translation of *Gidrobiologicheskiy zhurnal* and other Soviet journals) contained only one article covering predators of larval *Rana arvalis*.

Volumes 1-5 (1991-1995) of *Freshwater Forum* were also reviewed, but no paper dealing specifically with amphibians or reptiles was found. Although, one paper did briefly mention *Ambystoma*.

### REPORT ORGANIZATION

All titles from these journals referring to amphibians or reptiles are listed alphabetically by author in this bibliography. A total of 48 papers was identified. Junior authors are listed alphabetically and cross referenced to senior authors.

Following the bibliography is an index with scientific names of amphibians and reptiles listed alphabetically and cross-referenced to the article(s) where they are mentioned. All original names and spellings have been maintained. Scientific names found in the "literature cited" sections of papers are not included, nor are scientific names taken from references but not actually part of the study.

A subject index follows the scientific name index. Papers are categorized into eight broad categories based on content and cross-referenced by author(s) as in the scientific name index. Most papers deal with feeding and trophic relations of or chemical toxicity to various amphibians.

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*Acris crepitans*: Johnson 1991  
*Afrixalus fornasinii*: Patterson and McLachlan 1989  
*Aipysurus duboisii*: Redfield, et al. 1978  
*Aipysurus eydouxii*: Redfield, et al. 1978  
*Aipysurus foliosquama*: Redfield, et al. 1978  
*Aipysurus laevis*: Redfield, et al. 1978  
*Aipysurus tenuis*: Redfield, et al. 1978  
*Ambystoma barbouri*: Huang and Sih 1991  
*Ambystoma jeffersonianum*: Talantino and Landre 1991  
*Ambystoma laterale*: Kutka and Bachmann 1990; Talantino and Landre 1991  
*Ambystoma maculatum*: Clark and LaZerte 1987; Freda and McDonald 1993;  
                                  Glooschenko, et al. 1992; Kutka and Bachmann 1990; Talantino and Landre 1991  
*Ambystoma tigrinum*: Deutschman and Peterka 1988; Holomuzki 1989; Leff and  
                                  Bachmann 1988  
*Astrotia stokesii*: Redfield, et al. 1978  
  
*Bombina variegata*: Chardez 1968; Joly and Morand 1994; Morand and Joly 1995  
*Bufo americanus*: Clark and LaZerte 1985; Clark and LaZerte 1987; DuBois, et al. 1995;  
                                  Freda, J., et al. 1990; Freda and McDonald 1993; Glooschenko, et al. 1992; Kutka  
                                  and Bachmann 1990  
*Bufo bufo*: Chardez 1968; Joly and Morand 1994; Luiselli and Rugiero 1991; Manteifel and  
                                  Bastakov 1986; Morand and Joly 1995; Viertel 1992  
*Bufo calamita*: Chardez 1968; Joly and Morand 1994; Morand and Joly 1995; Viertel  
                                  1992  
*Bufo viridis*: Degani 1986  
  
*Caretta caretta*: Lester, et al. 1980  
*Carettochelys insculpta*: Jeffree 1991  
*Chelodina longicollis*: Jeffree 1991  
*Chelodina rugosa*: Jeffree 1991  
*Chelonia mydas*: Dailey and Morris 1995; Leh 1994  
*Chiromantis xerampelina*: Patterson and McLachlan 1989  
*Chrysemys picta*: Lindeman and Rabe 1990  
*Crocodylius niloticus*: Munro 1966  
  
*Dermochelys coriacea*: Eggleston 1971; McCann 1969  
*Dicamptodon ensatus*: Hawkins, et al. 1983  
*Disteira kingi*: Redfield, et al. 1978  
*Disteira major*: Redfield, et al. 1978  
  
*Elseya dentata*: Jeffree 1991  
*Elseya latisternum*: Jeffree 1991  
*Emydura signata*: Jeffree 1991  
*Emydura victoriae*: Jeffree 1991  
*Enhydrina schistosa*: Redfield, et al. 1978  
*Eurycea bislineata*: Stoneburner 1978

- Hydrophis caerulescens*: Redfield, et al. 1978  
*Hydrophis elegans*: Redfield, et al. 1978  
*Hydrophis inornatus*: Redfield, et al. 1978  
*Hydrophis ornatus*: Redfield, et al. 1978  
*Hyla arborea*: Chardez 1968; Degani 1986; Joly and Morand 1994; Morand and Joly 1995  
*Hyla crucifer*: Glooschenko, et al. 1992; Kutka and Bachmann 1990  
*Hyla versicolor*: Kutka and Bachmann 1990  
*Hyperolius argus*: Patterson and McLachlan 1989  
*Hyperolius marmoratus*: Patterson and McLachlan 1989
- Kassina senegalensis*: Patterson and McLachlan 1989
- Lapemis hardwickii*: Redfield, et al. 1978
- Natrix natrix*: Luiselli and Rugiero 1991  
*Natrix tessellata*: Luiselli and Rugiero 1991  
*Necturus* sp.: Gilderhus and Johnson 1980  
*Notophthalmus viridescens*: Kesler and Munns 1991; Kutka and Bachmann 1990;  
 Strohmeier, et al. 1989
- Pelamis platurus*: Redfield, et al. 1978  
*Pelobates syriacus*: Degani 1986  
*Pelodytes punctatus*: Joly and Morand 1994; Morand and Joly 1995  
*Phrynobatrachus natalensis*: Patterson and McLachlan 1989  
*Pseudacris triseriata*: Kutka and Bachmann 1990  
*Ptychadena anchietae*: Osborne and McLachlan 1985; Patterson and McLachlan 1989  
*Ptychadena mascariensis*: Patterson and McLachlan 1989  
*Ptychadena porosissima*: Patterson and McLachlan 1989  
*Pyxicephalus adspersus*: Patterson and McLachlan 1989
- Rana angolensis*: Patterson and McLachlan 1989  
*Rana arvalis*: Surova 1991  
*Rana clamitans*: Glooschenko, et al. 1992; Kutka and Bachmann 1990  
*Rana dalmatina*: Joly and Morand 1994; Morand and Joly 1995  
*Rana esculenta*: Chardez 1968; Joly and Morand 1994; Luiselli and Rugiero 1991;  
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*Rana johnstoni*: Patterson and McLachlan 1989  
*Rana pipiens*: DuBois, et al. 1995; Freda, J. et al. 1990; Glooschenko, et al. 1992  
*Rana ridibunda*: Degani 1986; Joly and Morand 1994; Manteifel and Bastakov 1986;  
 Morand and Joly 1995  
*Rana sylvatica*: Clark and LaZerte 1985; Freda and McDonald 1993; Glooschenko, et al.  
 1992; Kutka and Bachmann 1990  
*Rana temporaria*: Chardez 1968; Costa 1967; Joly and Morand 1994; Manteifel and  
 Bastakov 1986; Pravda 1973; Viertel 1992  
*Rana terrestris*: Manteifel and Bastakov 1986
- Salamandra salamandra*: Degani 1986; Degani, et al. 1980; Warburg, et al. 1979  
*Salamandra taeniata*: Chardez 1968

*Triturus alpestris*: Chardez 1968; Joly and Morand 1994; Morand and Joly 1995;  
Schabetsberger 1994; Schabetsberger and Jersabek 1995  
*Triturus cristatus*: Avery 1971a; Joly and Morand 1994; Morand and Joly 1995  
*Triturus helveticus*: Avery 1971a; Avery 1971b; Chardez 1968; Joly and Morand 1994;  
Morand and Joly 1995; Young and Reynoldson 1965  
*Triturus vittatus*: Degani 1986  
*Triturus vulgaris*: Avery 1971a; Avery 1971b; Watt and Oldham 1995  
*Varanus niloticus*: Munro 1966  
*Xenopus laevis*: Viertel 1992

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Aquatic Toxicity/Contaminants Clark and LaZerte 1985; Clark and LaZerte 1987; Costa 1967; Freda, et al. 1990; Freda and McDonald 1993; Gilderhus and Johnson 1980; Jeffree 1991; Kutka and Bachmann 1990; Pravda 1973

Behavior: Costa 1967; Degani 1986; Degani, et al. 1980; DuBois, et al. 1995; Kesler and Munns 1991; Stoneburner 1978

Distribution: Eggleston 1971; Glooschenko, et al. 1992; Munro 1966; Redfield, et al. 1978

Feeding/Trophic Interactions: Avery 1971b; Degani, et al. 1980; Holomuzki 1989; Huang and Sih 1991; Johnson 1991; Kessler and Munns 1991; Leff and Bachmann 1988; Luiselli and Rugiero 1991; Osborne and McLachlan 1985; Schabetsberger and Jersabek 1995; Strohmeier, et al. 1989; Surova 1991; Viertel 1992; Watt and Oldham 1995; Young and Reynoldson 1965

Growth/Development: Avery 1971b; Degani 1986; Degani, et al. 1980; Johnson 1991; Patterson and McLachlan 1989; Talantino and Landre 1991; Warburg, et al. 1979; Watt and Oldham 1995

Habitat: Glooschenko, et al. 1992; Hawkins, et al. 1983; Joly and Morand 1994; Lindeman and Rabe 1990; Morand and Joly 1995; Patterson and McLachlan 1989

Parasites: Avery 1971a; Chardez 1968; Dailey and Morris 1995; Lester, et al. 1980; McCann 1969

Reproduction: Leh 1994











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